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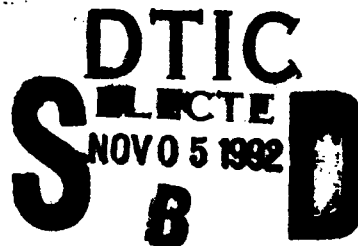July 1992

BLUE FLAG DISTRIBUTED WARGAMING SYSTEM

Synectics Corporation

Bob Daniels (E-Systems, Inc.)

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Air Force Systems Command
Griffiss Air Force Base, NY 13441-5700

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13. ABSTRACT (Maximum 200 words)

This report documents the Blue Flag Distributed Wargaming System (DWS) developed for the 4441st Tactical Training Group (Blue Flag), Hurlburt Field, Fl. The Blue Flag DWS expanded and enhanced the existing communication network, providing point-to-point communication that can be used with satellite and terrestrial communication systems to give the capability to communicate via secure voice, and data links with multiple Blue Flag remote sites.

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1.0 INTRODUCTION

1.1 Objective

This document presents the technical summary for the Blue Flag Distributed Wargaming System (DWS) developed for the 41st Training Group (Blue Flag). The Blue Flag DWS provides Blue Flag the capability to communicate via secure voice, video, and data directly with Blue Flag Remotes when they are participating in a Blue Flag exercise.

Section one describes the background and contract vehicle leading to the execution of the Blue Flag DWS contract. Section two presents an overview of the DWS equipment delivered under this contract. Section three describes the exercise support and installations performed by E-Systems at the Blue Flag hub and the remote sites. Section four presents E-Systems recommendations for improved operation and further success of the Blue Flag DWS.

1.2 Background

In June of 1990, E-Systems Inc., Garland Division, entered into a contract with the U. S. Air Force Electronic Systems Division (ESD) to support a feasibility demonstration of the DWS distributive techniques, combat simulation, and multi-site video teleconferencing (VTC). The Warrior Flag 90 feasibility demonstration was sponsored by the 4441st Tactical Training Group (now the 41st Training Group), Blue Flag, Hurlburt Field, Florida, a unit of the U. S. Air Force Air Warfare Center. E-Systems delivered and installed the VTC Multiplexer System under this contract.

In October 1991, E-Systems entered into a contract with Synectics Inc, through ESD and Rome Laboratory, to design, procure and install a Communication Hub, two Hub VTC Suites, and DWS Processor at the Blue Flag Complex and five remote site kits to support Blue Flag distributive exercises.

Additionally, E-Systems was to provide exercise support to operate the equipment at the hub and remote locations during the Blue Flag (BF) 92-1 exercise, held in January 1992. The sites supported by Blue Flag 92-1 were the 41st Training Group at Hurlburt Field, Florida; Tactical Training Group, Pacific at Pt. Loma, San Diego, California; the 363rd Fighter Wing, at Shaw AFB, South Carolina; the 33rd Fighter Wing, at Eglin AFB, Florida; and the Army Site, located to Hurlburt Field, Florida, for the exercise.

This document satisfies CDRL K008 and L006 of that contract. The Blue Flag DWS program schedule is shown in Figure 1.2-1.

Activities	Oct '91					Nov '91				Dec '91				Jan '92					Feb '92				Mar '92			
	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	2	9	16	23
PROGRAM REVIEWS				●				●																		
MATERIALS ORDER	▬	▬																								
ME/EE DESIGN	▬	▬	▬	▬	▬	▬	▬	▬																		
MATERIALS RECEIVED							▬	▬	▬	▬	▬															
INTEGRATE EQUIPMENT											▬	▬														
SYSTEM INTEGRATION & TEST												▬	▬													
PACK, CRATE, AND SHIP														▬												
DWS PROCESSOR INSTALLED												▬														
ONSITE INSTALL AND TEST															▬											
SYSTEM TRAINING																▬										
BF 92-1 EXERCISE SUPPORT																	▬									
FINAL REPORT PREPARATION																			▬	▬	▬	▬	▬	▬	▬	
MONTHLY REPORT (001)							●				●				●					●				●		
COTS MANUALS (002)															●											
BRIEFING MATERIALS (003)							●																			
PROGRAM PLAN (004)					●	●																				
SITE INSTALL PLAN (005)							●			●																
MEETING MINUTES (006)						●			●																	
ACCEPTANCE PLAN (007)											●				●											
FINAL REPORT (008)																										●

Figure 1.2-1. Blue Flag DWS Program Schedule.

2.0   BLUE FLAG DWS SYSTEM

The Blue Flag DWS consists of a central hub connected via military or commercial long-haul communications to the remote sites in a wide-area network architecture. The network architecture is designed to enable voice, VTC data, and computer data, from a variety of external systems, to be routed to the appropriate location via a single multiplexed secure data stream. The Blue Flag communication hub was designed to support up to eight remote sites. Five remote site kits were purchased and delivered via this contract.

2.1   PHYSICAL DESCRIPTION

2.1.1   Communication Hub Equipment

The Blue Flag Communication Hub equipment consists of: one communication equipment rack containing the encryption and long-haul interface equipment; and two communication equipment racks supplying the data multiplexing capability, the computer data network bridge and routing functions, and a Private Automated Branch Exchange (PABX) providing the telephone data switching function. Three additional racks were furnished by the 41st TG providing the multi-point VTC capability. These were provided by E-Systems under the Warrior Flag contract. The Communication Hub equipment, shown in Figures 2.1-1 and 2.1-2, was designed to support up to eight remote sites. Two Hub VTC suites (shown in Figure 2.1-3) were also delivered to the Blue Flag hub providing cameras, monitors and control in support of the video teleconferencing capability. Additionally a DWS Processor (VAX 6640) was procured and installed in the Blue Flag Computer Room.

2.1.2   Remote Site Kit Equipment

Five Blue Flag Remote Site Kits were provided. Each remote site kit consists of two suites: a Secure Communication Suite (SCS), and a Remote Site Video Teleconferencing (VTC) Suite. The SCS consists of three transport cases, containing communication, encryption, data multiplexing, telephone, and computer data equipment. The Remote Site VTC Suite consists of four transport cases, containing the cameras, monitors, video compressor/decompressor (codec), speakers, and control units used to perform video teleconferencing. The Secure Communication Set was housed in three transit cases as shown in Figures 2.1-4, 2.1-5, 2.1-6, and 2.1-7. The Terminal and Multiplexer Cases house RED equipment and the Crypto Case houses BLACK equipment. The Crypto Case contains power filters and special cables to maintain RED/BLACK separation. Labelled interface panels were provided on the rear of the cases to make cable connections. The controller terminal and telephone were mounted on a sliding tray. The terminal is a laptop model that folds down for transport. The Remote Site VTC Suite is shown in Figure 2.1-8.
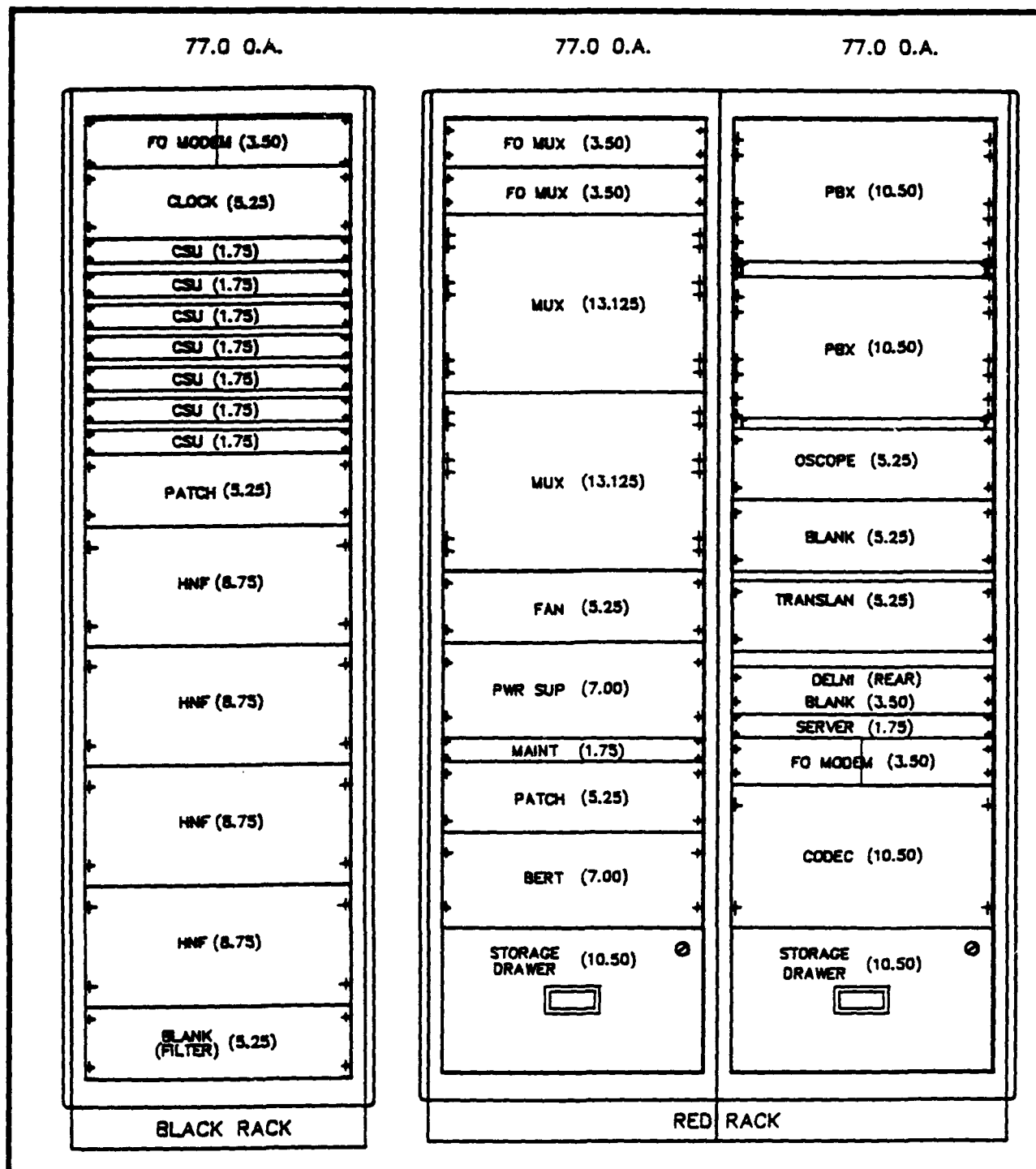
Figure 2.1-1. Communication Hub Racks.
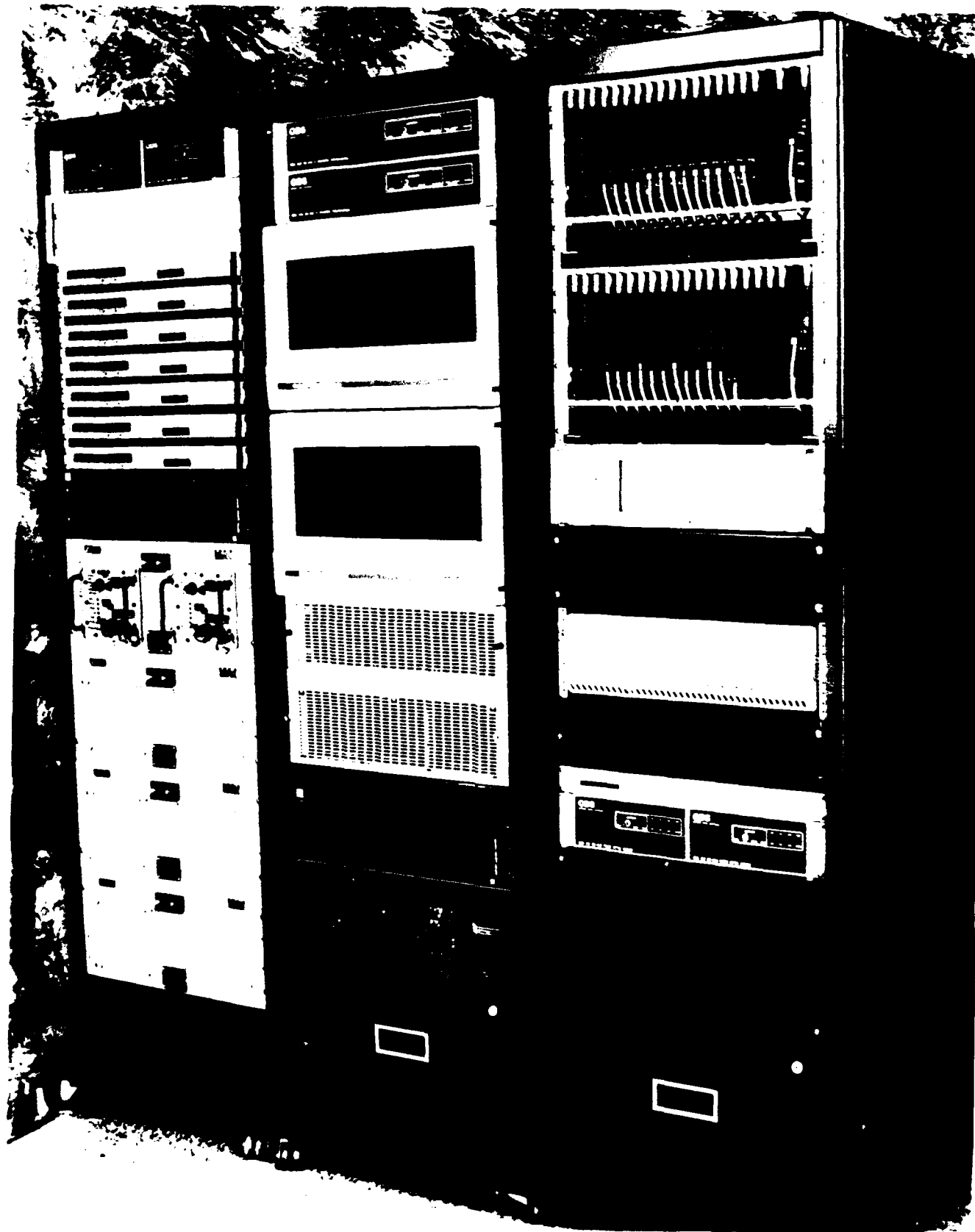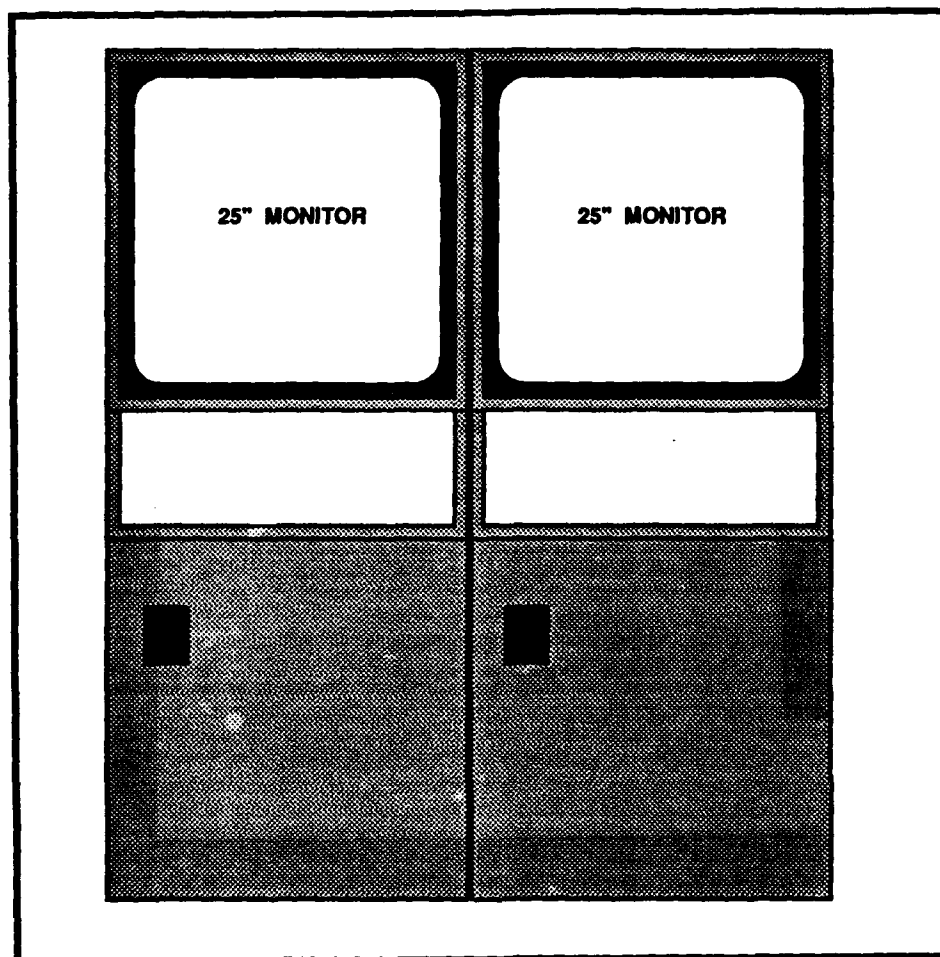
Figure 2.1-3. Hub VTC Suite.

2.2   FUNCTIONAL DESCRIPTION

Blue Flag exercises demand that multiple geographically dispersed users be able to simultaneously participate in wargaming activities. In order to provide this capability, the Blue Flag DWS supports computer to computer, video teleconferencing and telephone communication, all running at a variety of independent digital data rates. Through the use of a robust communication multiplexer and other long-haul interfacing equipment, the Blue Flag DWS provides flexibility in designing a communication network to support exercises.
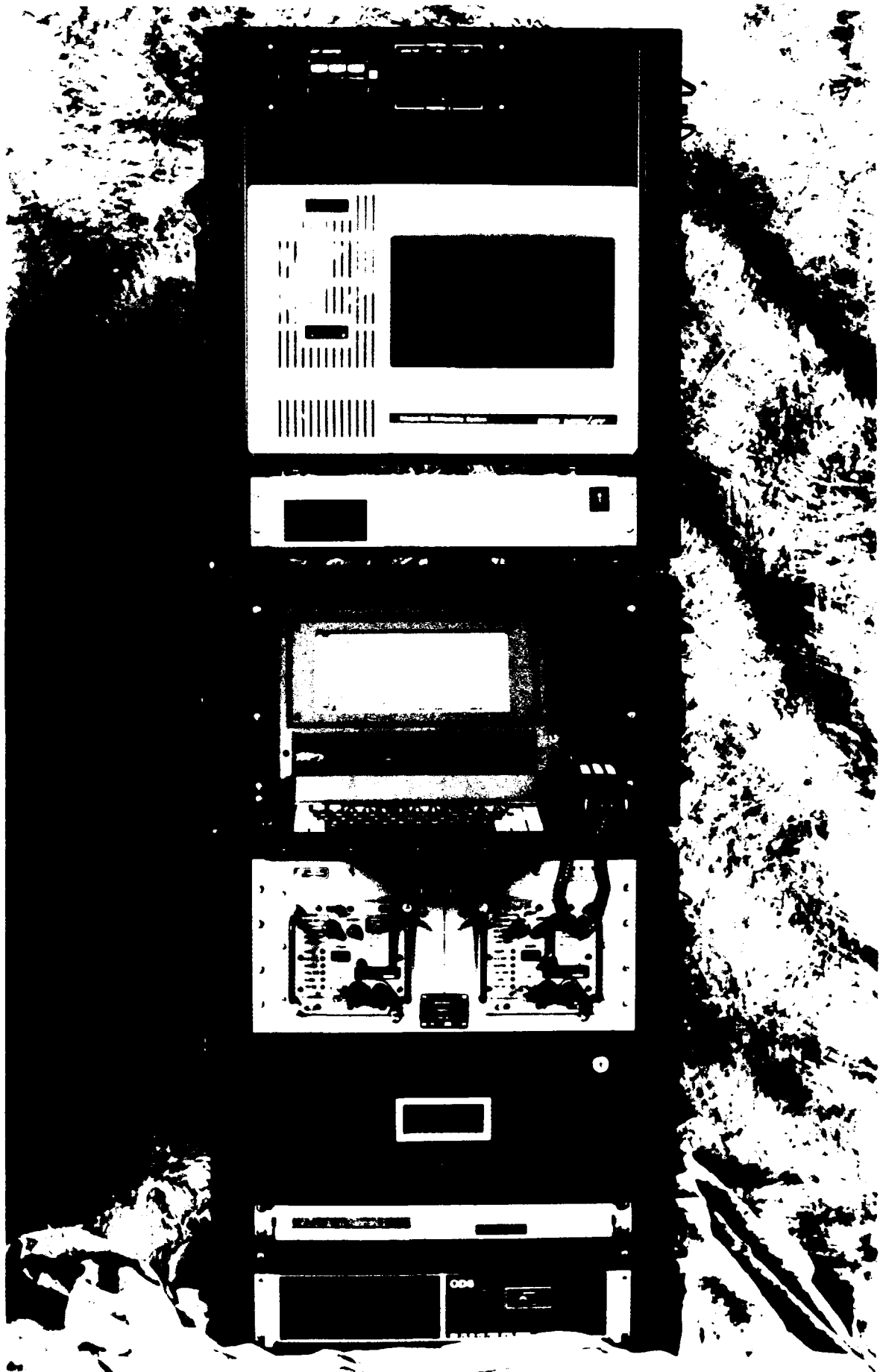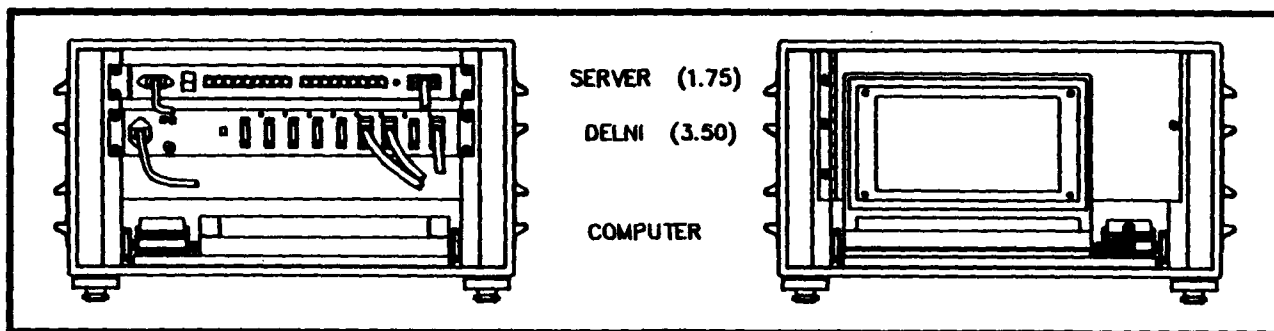
Figure 2.1-5. Secure Communication Set Terminal Case.

SERVER (1.75)

DELNI (3.50)

COMPUTER
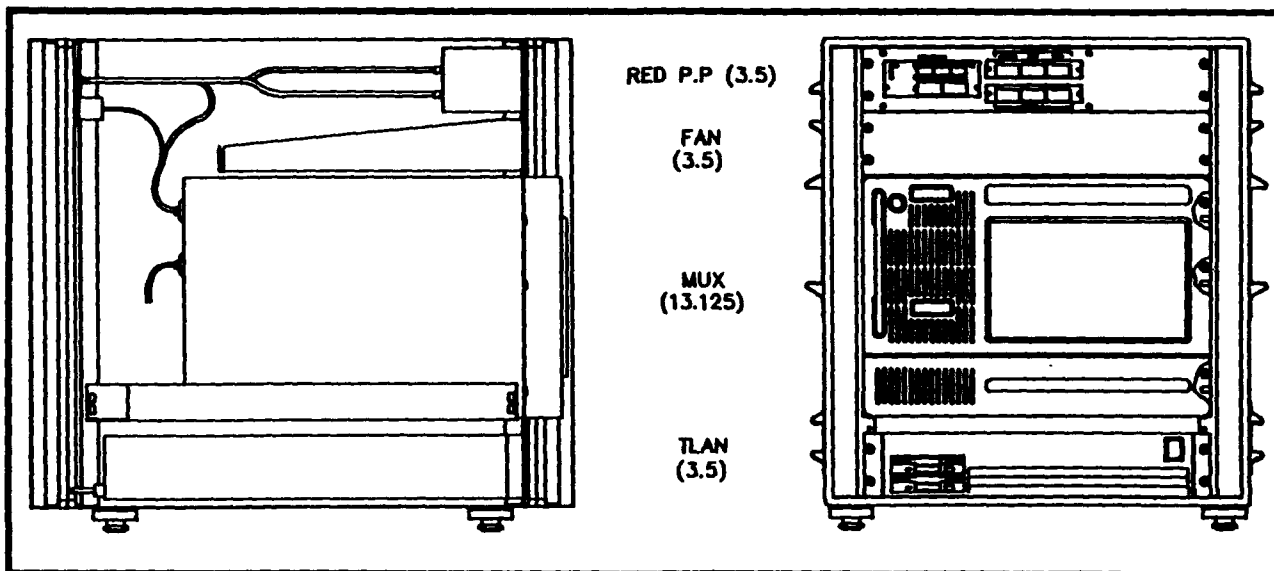
Figure 2.1-6. Secure Communication Set Multiplexer Case.

RED P.P (3.5)

FAN
(3.5)

MUX
(13.125)

TLAN
(3.5)
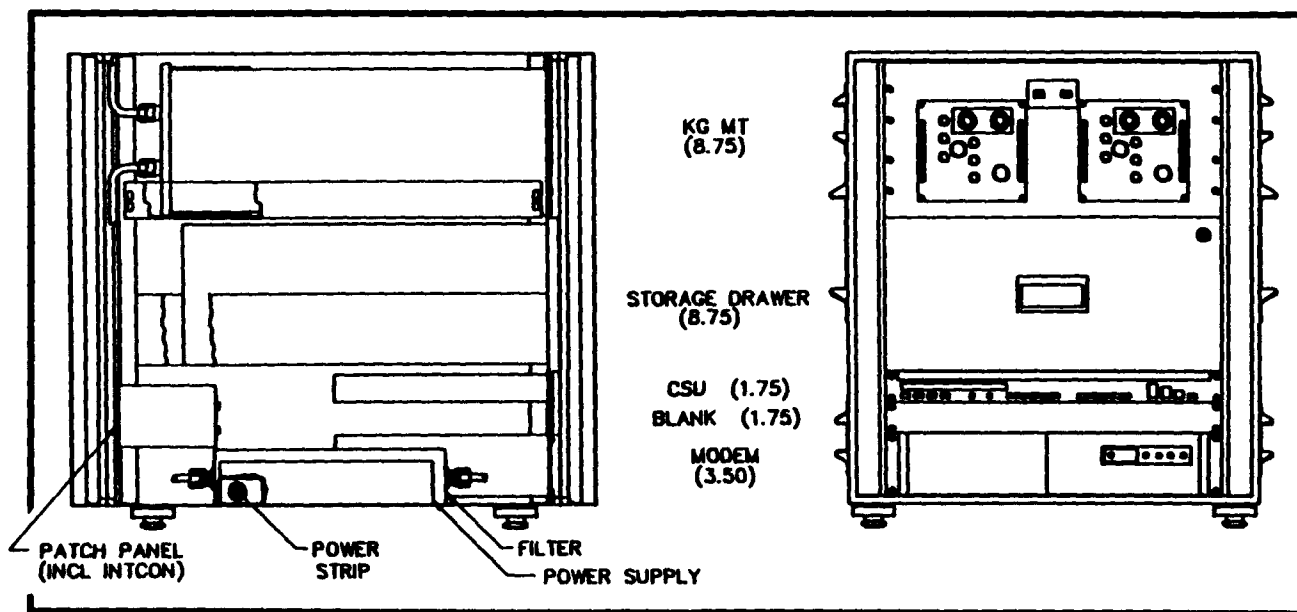
Figure 2.1-7. Secure Communication Set Crypto Case.

KG MT
(8.75)

STORAGE DRAWER
(8.75)

CSU (1.75)
BLANK (1.75)

MODEM
(3.50)

PATCH PANEL
(INCL INTCON)

POWER
STRIP

FILTER

POWER SUPPLY
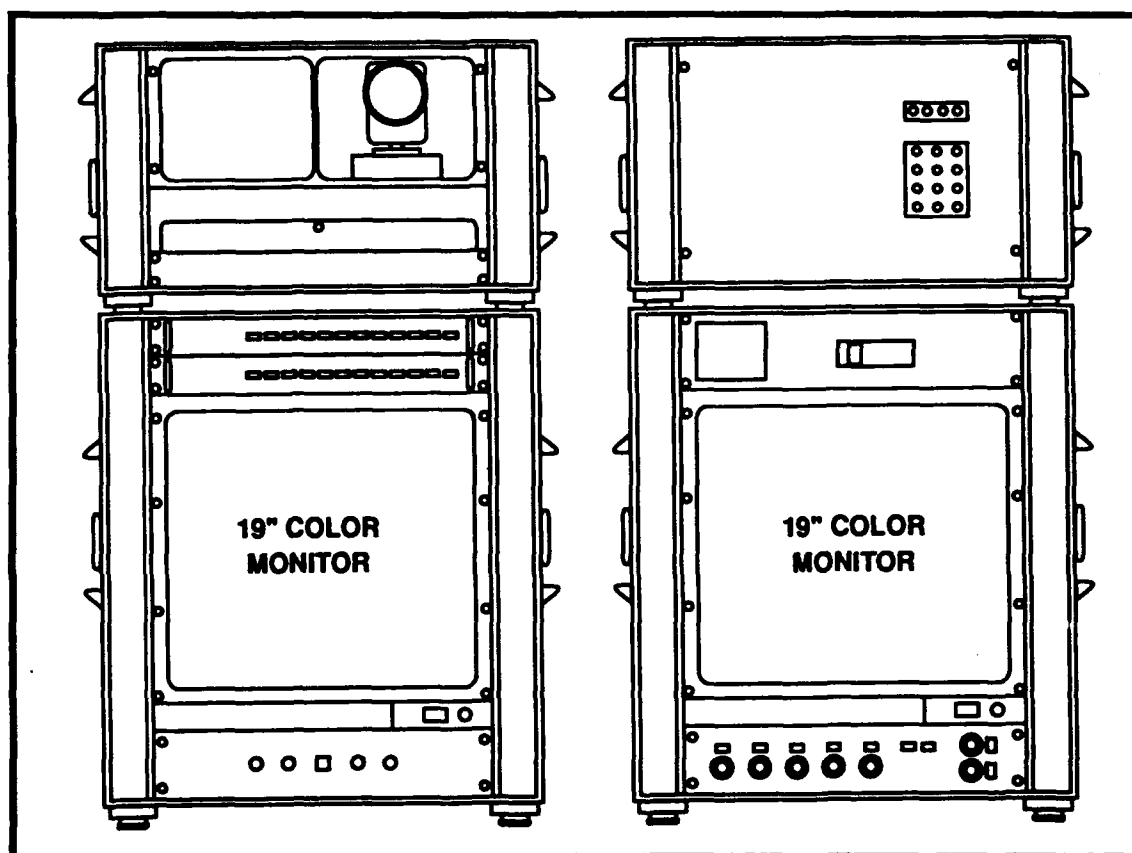
Figure 2.1-8. Blue Flag Remote Site VTC Suite.

Figure 2.2-1 shows the Blue Flag DWS major equipment components. These components comprise the six DWS functional subsystems. The Secure Transport Subsystem provides the secure long-haul communications between the Blue Flag hub and the remote sites. The Communication Multiplexer Subsystem connects to the Secure Transport Subsystem and provides the interface for the remaining subsystems. The Computer Data Subsystem provides a wide area network that connects the players, both at Blue Flag and at the remote sites, to the Blue Flag computers. The VTC Subsystem provides point-to-point and multi-point video teleconferences. The Telephone Subsystem provides a telephone network that allows telephonic control of the game play. The CAFMS Subsystem provides remote CAFMS displays at the sites as if they were directly connected to the CAFMS Van located at the Blue Flag Hub Complex.

The computer data, VTC information, and telephone data streams are multiplexed by a Timeplex communication multiplexer, forming one aggregate serial data stream. The aggregate stream--running at any multiple of 56 or 64 kbits/second up to 1.536 Mbits/second for T1 circuits or 1.024 Mbits/second for SATCOM circuits--is then passed to military encryption devices. TSEC/KG-94s or TSEC/KG-81s are supported. The secure data stream is then passed on to a Channel Service Unit/Data Service Unit (CSU/DSU) for commercial T1 circuits, or to the tactical satellite van via fiber optic modems, for military/commercial SATCOM circuits. The CSU/DSUs provide the necessary data framing, bringing the aggregate serial data rate to the 1.544 Mbits/second, required for T1 circuits.
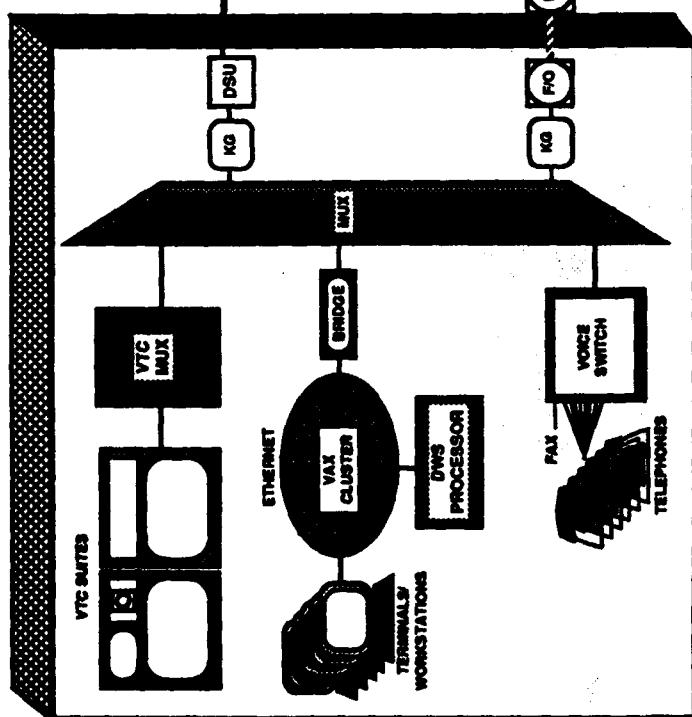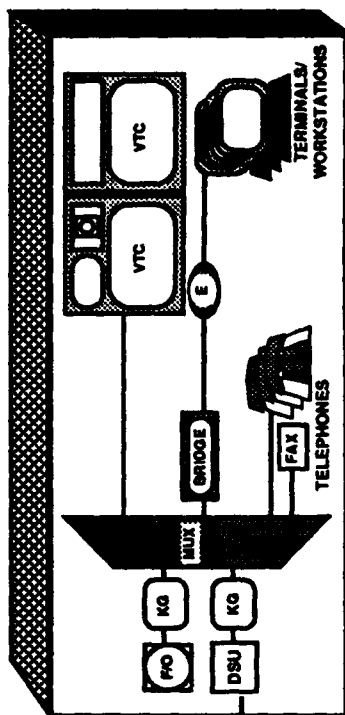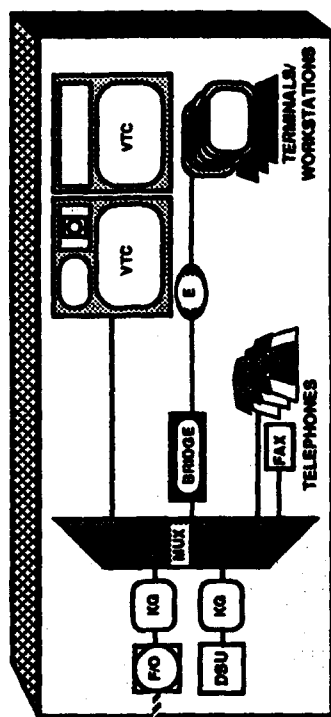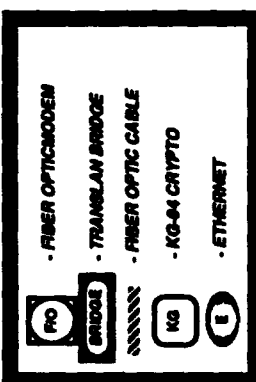
Figure 2.2-1. Blue Flag Distributed Wargaming System Major Components.

Fractional T1 rates are also supported. The equipment and corresponding subsystems of the DWS architecture are described in the following paragraphs.

2.2.1 Secure Transport Subsystem

The Secure Transport Subsystem supports eight long-haul point-to-point secure communication circuits to connect the Blue Flag Hub to the remote sites. The Secure Transport Subsystem consists of communication circuits, line conditioning devices, modems, encryption devices, and patch panels that provide the long-haul communications to connect the hub to the remotes. The Blue Flag Hub supports eight long-haul point-to-point secure communication circuits, up to seven commercial or military leased T1 or Fractional-T1 lines, and up to two military or commercial SATCOM circuits. The DWS equipment supports both the AMI and B8ZS coding formats, and the D4 and ESF framing formats.

Each remote site supports either a SATCOM circuit or leased line. TSEC/KG-81/94 encryption devices provide for secure transmission. The long-haul communication circuits and encryption devices are Government furnished. Figure 2.2-2 shows the Secure Transport Subsystem and its major components. The demarcation between the Secure Transport Subsystem and the Multiplexer Subsystem is the RED Patch Panel. The major components of the Secure Transport Subsystem are described in the following paragraphs.

2.2.1.1 Channel Service Unit

Cylink 4202 Channel Service Units (CSU) provide line conditioning for the leased lines. These CSUs interface to and are compatible with TSEC/KG-81/94 trunk encryption devices. These CSUs support both AMI and B8ZS line encoding and D4 and ESF framing to interface with long-haul T1 and fractional T1 circuits. Each Cylink CSU contains a built-in data service unit (DSU) that converts the RS-422 signal levels generated by the encryption devices to T1 signal levels. Seven CSUs were provided at the hub and one in each remote sit kit. Four of the CSUs at the hub have provisions for external clocking sources, should the leased lines not provide it.

2.2.1.2 Fiber Optic Modems and Fiber Optic Cable

ODS 219 Fiber Optic Modems were provided to extend the long-haul encrypted RS-422 signals via fiber optic cable to SATCOM vans. For the hub a pair of modems is located in the BLACK Communication Rack and a pair were provided for the SATCOM van. For each remote site kit, a modem is mounted within the Crypto Case. Two fiber optic modem to tactical SATCOM TSSP cables were provided for the hub and one with each remote site kit.

Six rugged fiber optic cables with ST connectors were provided; two 1000-meter, two 500-meter, and two 250-meter cables. These cables support the Blue Flag DWS requirement for four SATCOM fiber optic cables as well as two spares.
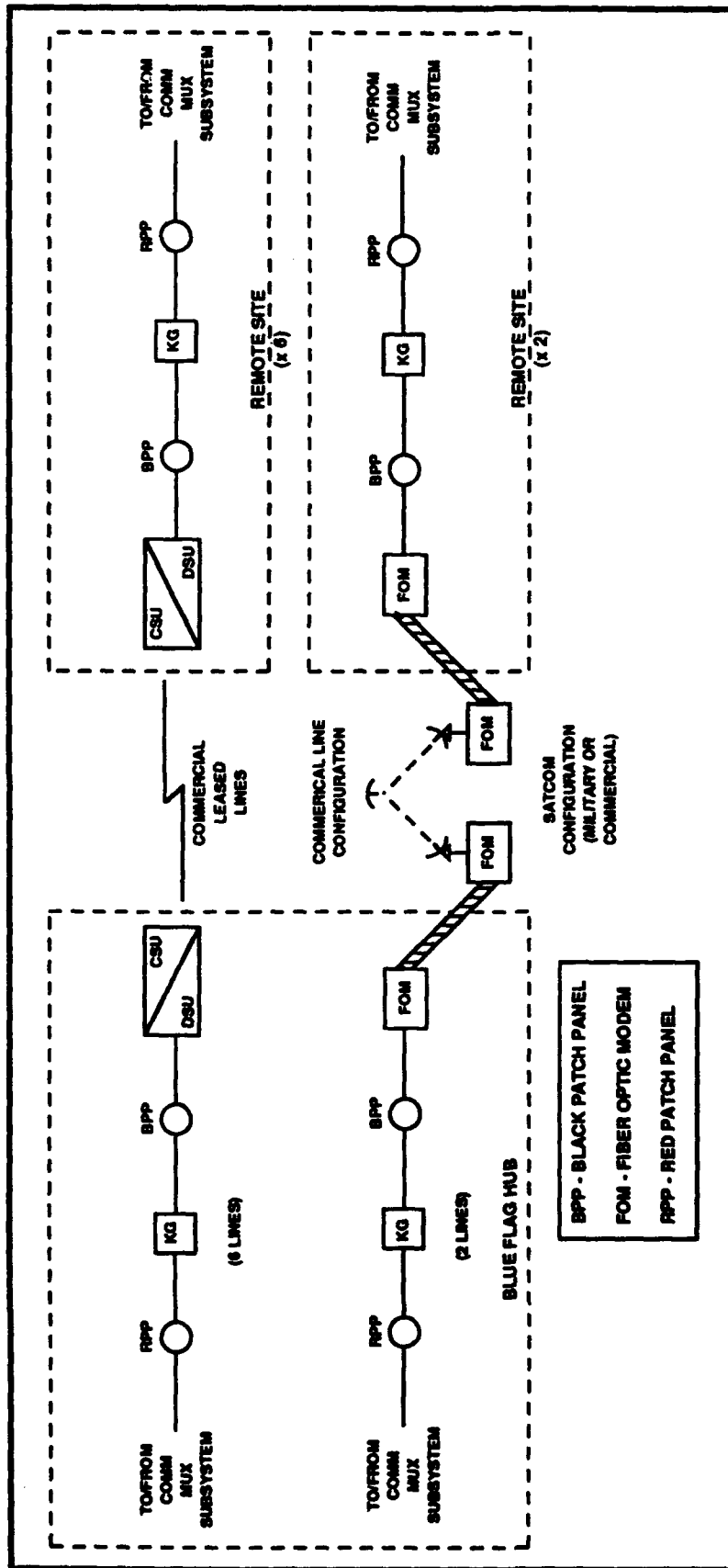
Figure 2.2-2. Secure Transport Subsystem Major Components.

2.2.1.3   Crypto Mount and Power Supply

HNF-81-1 Crypto Frames were provided for the purpose of mounting TSEC/KG-81 or TSEC/KG-94 encryption devices. 28 Volt Power Supplies provide the required 28 volts, direct current power to the encryption devices. The hub contains four HNF-81-1 frames (for eight cryptos) and each remote site kit contains one frame (for two cryptos). The remote site kit has one crypto on-line and one as hot spare. E-Systems provided the HNF-81-1 frames and the cryptos are Government furnished.

2.2.1.4   BLACK Patch and Test Panels

The BLACK Patch and Test Panel are located between the encryption devices and the channel service unit and SATCOM fiber optic modem. Its purpose is to provide RS-422 cross patching, loop-back and test points. At the hub six CSUs and two fiber optic modems were cabled in the normal-thru configuration. The seventh CSU can replace a fiber optic modem via a cross patch. At the remote sites, the on-line crypto to CSU is the normal-thru configuration. The spare crypto or the fiber optic modem may be placed on-line via a patch. Loop plugs were provided for testing. Clock switches were provided to switch-in the BLACK Station Clock signal of the cryptos for circuits that have no network clock.

2.2.1.5   Station Clock

An Austron 1295D Station Clock was provided at the hub. It contain a 10MHZ quartz oscillator and two divide-down synthesizers (1.544MHz and 1.024MHz). The 1.544MHz synthesizer is used for T1 circuits and commercial SATCOM circuits and the 1.024MHz for tactical SATCOM circuits.

2.2.2   Communication Multiplexer Subsystem

The Communication Multiplexer Subsystem combines the computer, VTC, CAFMS, and voice data into a single aggregate data stream that can be transmitted over the Secure Transport Subsystem. The Communication Multiplexer Subsystem consists of Timeplex communication multiplexers at the hub and remote sites. Each multiplexer consists of a processor card and interface cards for the various interface functions to the other subsystems. Figure 2.2-3 shows the Communication Multiplexer Subsystem and its major components.

2.2.2.1   Communication Multiplexer

Timeplex Communication Multiplexers were provided for the Blue Flag DWS. A dual 18-slot Link/2 chassis was provided at the hub and a 13-slot MiniLink chassis was provided with each remote site kit.
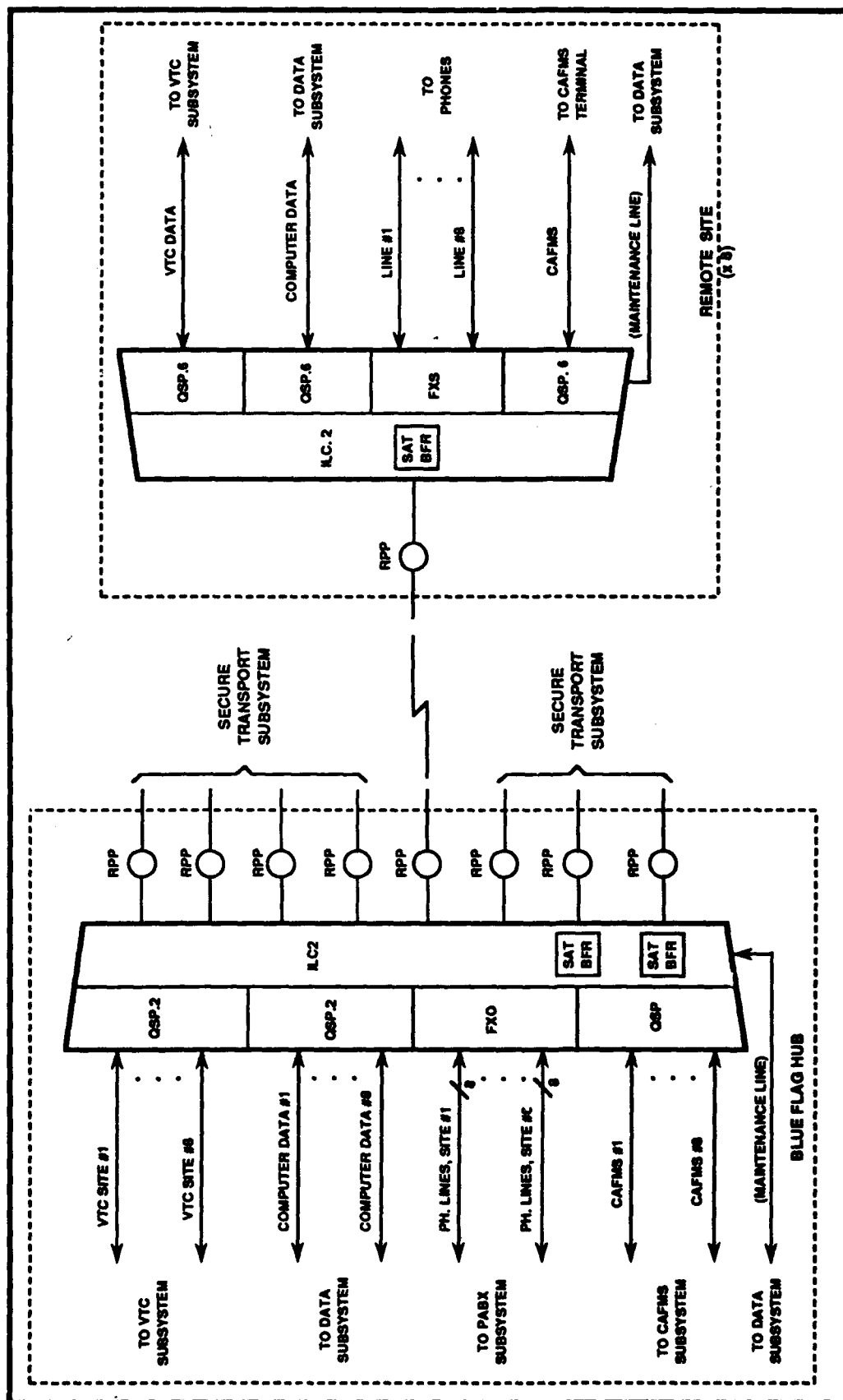
Figure 2.2-3. Communication Multiplexer Subsystem Major Components.

The hub Communication Multiplexer has redundant network control modules that automatically switch should the on-line unit fail. The hub multiplexer has eight link cards that correspond to the eight long-haul circuits. Two were provided with satellite buffers. This multiplexer has four quad RS-422 cards to support the VTC and computer data, plus two quad RS-232 cards to support the CAFMS data. The 64 remote telephone lines connect to 16 quad telephone cards. A by-pass module provides for direct connect VTC conferences. Figure 2.2-4 shows the Blue Flag Hub Communication Multiplexer configuration.

LINK 2 EXPANDER FRAME	DRED	FXO 1	FXO 2	FXO 3	FXO 4	FXO 5	FXO 6	FXO 7	FXO 8	FXO 9	FXO 10	FXO 11	FXO 12	FXO 13	FXO 14	FXO 15	FXO 16	17	18
LINK 2 CONTROL FRAME	DRC	NCL 1	NCL 2	ILC 3	ILC 4	ILC 5	ILC 6	ILC 7	ILC 8	ILC 9	ILC 10	QSP2 11	QSP2 12	QSP2 13	QSP2 14	QSP 15	QSP 16	17	BPM 18

Figure 2.2-4. Hub Communication Multiplexer.

The Timeplex MiniLink/2 Communication Multiplexer is compatible with the Blue Flag Hub Communication Multiplexer. This multiplexer equipment includes two high-speed data channels (one for video and one for digital data), one low speed data channel (for CAFMS), and eight voice channels. The communication multiplexer combines these channels into a single bit stream for encryption and transmission over the long-haul communication circuits. This Communication Multiplexer equipment supports one terrestrial T1 interface or one SATCOM interface and includes a satellite buffer. Figure 2.2-5 shows the remote site kit Communication Multiplexer configuration.

2.2.2.2   RED Patch and Test Panels

RED Patch and Test Panels provide the capability to perform cross-patching, looping, and testing of signals. Loop plugs were provided so signals can be switched into the loopback mode. Test points were provided to permit monitoring signals. The RED Patch Panel is between the Communication Multiplexer and the encryption devices and has the capability to disable the crypto resync signal from the Communication Multiplexer to aid in troubleshooting.

MINILINK CHASSIS	POWER SUPPLY	N C L		I L C				Q S P 6				F X S	F X S	
	48V P. S.	1	2	3	4	5	6	7	8	9	10	11	12	13
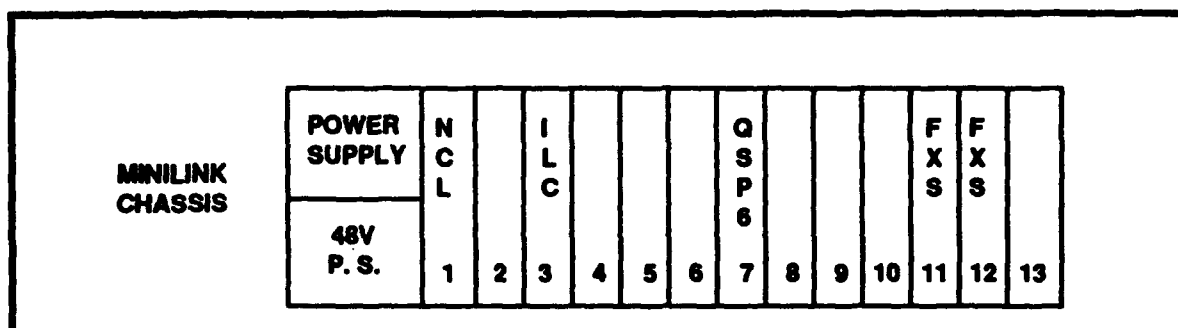
Figure 2.2-5. Remote Site Kit Communication Multiplexer.

2.2.3 Computer Data Subsystem

A requirement to provide a secure, high speed data communication capability between Blue Flag, and remote sites is accomplished through the use of a Wide Area Network (WAN) which connects the Blue Flag Hub ethernet to ethernets located at the remote sites. Computers located at Blue Flag communicate via the ethernet to terminals and work stations at the remote sites. The WAN employs LAN interconnects (DELNIs), terminal servers, and Vitalink TransLAN bridge/routers to interconnect the Blue Flag Hub Complex and remote site ethernets forming a single, cohesive WAN. Any system capable of connection to an ethernet can be immediately connected to the remote sites via the WAN. The overall Blue Flag Computer Data Subsystem is shown in Figure 2.2-6. E-Systems also provided a VAX 6640 computer, two operator terminals at the hub and one operator terminal with each remote kit. All game play workstations and terminals were Government furnished. The major components of the Computer Data Subsystem are described in the following paragraph.

2.2.3.1 Blue Flag DWS Processor

A Digital Equipment Corporation VAX 6640 computer system was supplied and installed in the Blue Flag computer center. Major components of the system include: an Ethernet Adapter, one VAXBI Adapter, a TK70 Console Tape Drive, two 128 Mbytes XMI-2 Memory Units, a VAX Cluster Interface and CI-bus cable. Mass storage devices were supplied as GFE by Blue Flag.

The VAX was supplied and licensed with the ULTRIX Operating System, DECnet/OSI, and VAX Fortran and were upgraded from a 32-64 users license to unlimited usage. Prior arrangements have been made between Digital Equipment Corporation and Blue Flag to supply and license the VAX/VMS Operating System. The VAX system was installed and tested at the Blue Flag computer facility.
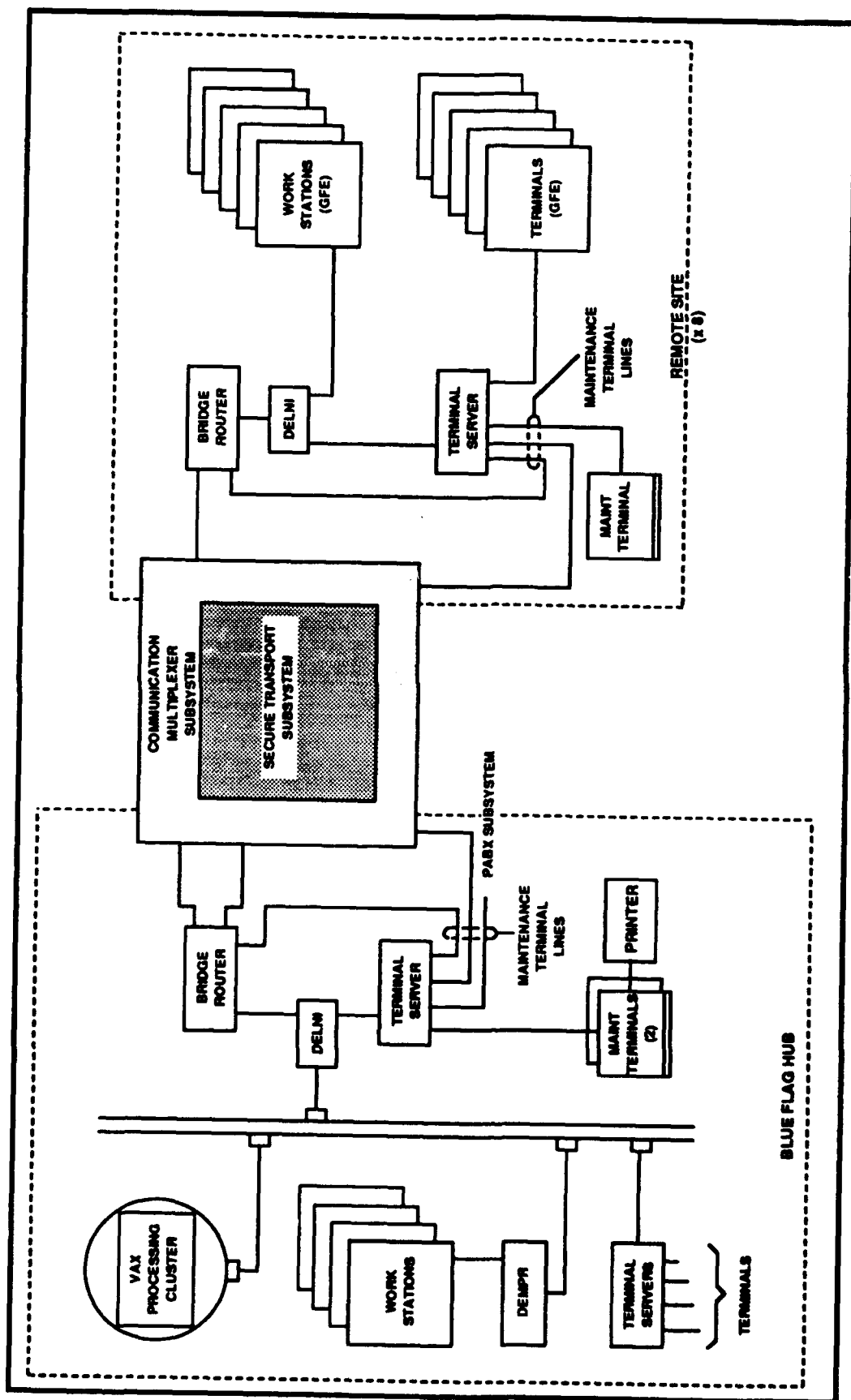
Figure 2.2-6. Computer Data Subsystem Major Components.

2.2.3.2   Bridge Router

Vitalink Translan Bridge Routers were provided to extend the Blue Flag ethernet LAN to the remote sites. A Translan 350 with eight ports was provided at the hub and a two-port Translan 335 was provided with each remote site kite. The Bridge Routers were configured with RS-530 channel interfaces that were connected to the high speed channel inputs of the communication multiplexers. The Bridge Routers are connected to the LAN interconnects, thereby creating an IEEE 802.3 LAN at the remote site. The remote site Translan and the Blue Flag Hub Translan extend the Blue Flag LAN to the remote site, thus forming a wide area network.

2.2.3.3   Local Area Network Interconnect

DEC LAN Interconnects (DELNI) were provided. The hub LAN Interconnect is connected to the hub bridge router and the Blue Flag ethernet. The remote site LAN Interconnect is connected to the remote site bridge router thus creating a stand-alone remote site LAN. The remote site LAN Interconnects provide five additional IEEE 802.3 MAU interfaces to which Government supplied workstations or equipment may be attached to the remote site LAN.

2.2.3.4   Terminal Server

Datability VCP Terminal Servers were provided that permit connection of terminals and operator interface ports of both the Communication Multiplexer and Bridge Router. The terminal servers are connected to the LAN (via the LAN Interconnects) and allow the operator (or any other terminal connected to the LAN) to selectively connect to each of these devices through the ethernet. Each remote site terminal server has 15 ports that are available for Government furnished player terminals. E-Systems provided a 1000 foot roll of 8 conductor silver satin cable and connectors for each site. Terminal cables were built on site to the required length.

An eight-port terminal server was provided at the hub to connect the communication multiplexer, bridge router, PABX, and operator terminal to the Blue Flag ethernet. This terminal server allows the operator to selectively connect to each of these devices through the ethernet.

2.2.3.5   Operator Terminal and Serial Printer

Two DEC VT-420 operator terminals were provided at the Blue Flag Hub to control the communication multiplexer, PABX, and bridge router. A serial printer was provided to allow network setup commands and status to be printed for training or analysis.

A built-in laptop operator terminal was provided with each remote site kit to allow the operator to control the communication multiplexer and bridge router. The VT-220 compatible terminal is mounted on a sliding tray that stows for transportation.

2.2.4   Video Teleconferencing Subsystem

The Blue Flag DWS was designed to utilize the Video Teleconferencing Multiplexer at Blue Flag delivered under the Warrior Flag Contract. This multiplexer, combined with the hub and remote VTC suites provided by E-Systems under this contract, comprise a unique Video Teleconferencing capability. The resultant VTC Subsystem provides near-full motion (compressed) video, combined site audio, and simultaneous high resolution freeze-frame graphics. The system provides the ability to support point-to-point VTC capability between any two remote sites and VTC multiplexing between multiple sites. Moreover, two or more conferences between different groups of conferees concurrently, is also possible.

A key and rather unique capability provided by the VTC Subsystem is the multi-point VTC multiplexing. This capability enables four or nine conferees to teleconference simultaneously. In a four-square conference, four conferees are displayed on the motion video screen simultaneously. In a nine-square conference, nine conferees are displayed on the motion video screen simultaneously. Audio from each conferee is summed together with that from the other conferees and returned to each remote site. Command files are created to configure each teleconference. These files are executed on the VTC control computer. The VTC Subsystem is presented in Figure 2.2-7.

Under this contract, E-Systems provided two Hub VTC suites for use at the Blue Flag hub. One transportable Blue Flag Remote Site VTC Suite was provided with each remote site kit (five total). The suites are described in the following paragraphs.
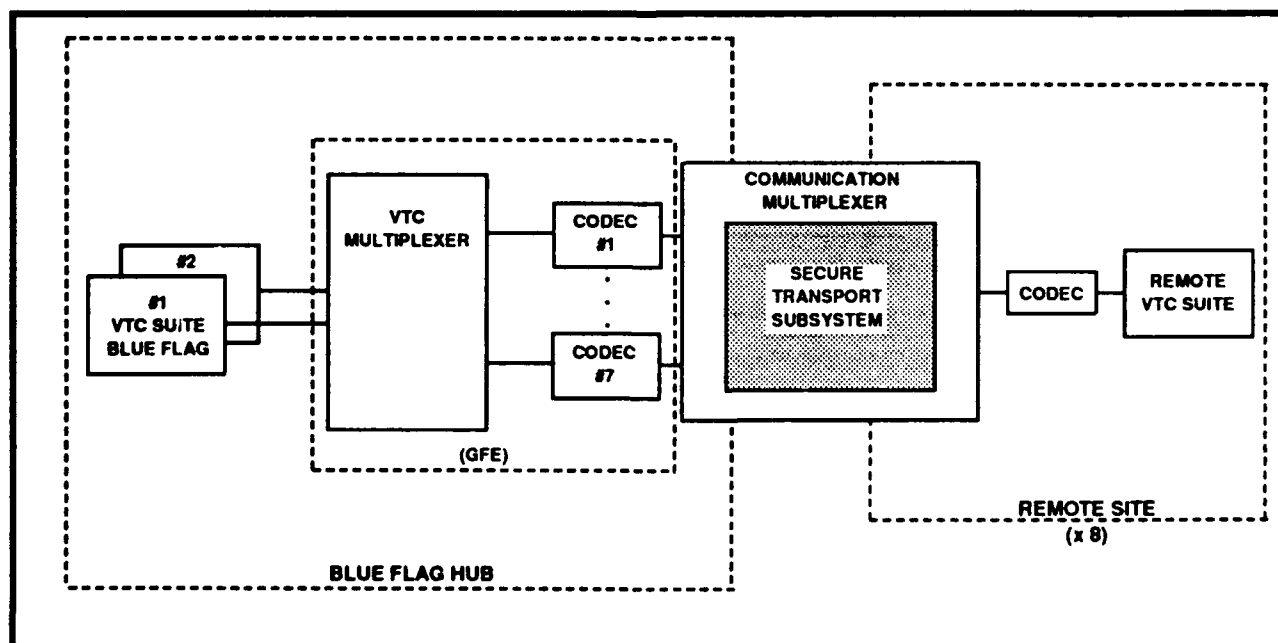
Figure 2.2-7. VTC Subsystem Major Components.

2.2.4.1   Remote Kit VTC Suites

Five Remote Site VTC Suites were supplied. The major components of a remote VTC suite are the PictureTel C-4000 video codec, 19 color monitors, video cameras, audio system, microphone, speaker, video printer, control panel, and transit cases, as previously shown in Figure 2.1-8.

Two 19-inch color monitors were provided in each suite. One monitor is normally used to display incoming video, while the other monitor typically displays graphics. A picture-in-picture (PIP) function was provided to view outgoing video on one of the two monitors. Two video cameras with remote control for pan, tilt, and zoom were provided. One camera was housed in the transit case, primarily for outgoing motion, while the other is mounted on a tripod for wall maps, other graphics, or motion video. The sound system is integrated within the codec. The control unit enables participants to remotely control the cameras, audio, and mode selection for the VTC monitors. Additionally, the control panel provides audio mute selection; graphic send capability; camera selection, pan, tilt, and zoom, as well as display selection (including PIP control) of incoming and outgoing motion and graphics. The equipment is mounted in four (two 1x2x4 and two 2x4x4) transportable metal transit cases that provide stability and support for the equipment. The cases are equipped with handles for transportability, and when sealed, are weather resistant. A 100 foot interface cable was provided with each remote site VTC suite.

2.2.4.2   Hub VTC suites

Two Blue Flag DWS Hub VTC Suites were provided. The suites are similar to the remote site suites described above, with the exception that each hub suite is housed in two commercial cabinets, suitable for a conference room, with 25-inch Sony color monitors mounted above each cabinet. One graphics stand/camera combination was provided to permit briefings to be sent as graphics.

2.2.4.3   VTC Multiplexer System

This program provides VTC multiplexing capability enabling four or nine conferees to teleconference simultaneously. Though this exercise was conducted with five locations, up to a nine-square conference, (nine conferees displayed on the motion video screen simultaneously) can be supported. The Government furnished VTC Multiplexer System equipment to perform this function includes a Grass Valley Group Horizon 32x32 video switcher, a Ramko Research 16x16 audio mixer, a Videoplex video multiplexer, and a Ramko Research 4x8 RS-232 signal switcher used to route the commands for controlling the transmission of graphics. Also included are 12 four-inch color monitors for monitoring the video from all the remote sites, a Sony 13-inch color monitor for viewing a selected video, a speaker to monitor the audio, and a push-to-talk microphone. This equipment is controlled by an E-Systems provided IBM compatible personal computer with removeable media with an IDS Plus8-8 eight port serial card with E-Systems provided software. A spare Plus8-8 serial card was provided. Command files were created to set up and control the various teleconferences.

Point-to-point teleconferencing between any combination of remote and/or hub locations are available. E-Systems also provided and installed SG3 software upgrade kits for the seven Government owned VTC codecs located at the Blue Flag Hub Complex. These upgrades brought these C-3000 codecs to the latest software release.

2.2.5   Secure Telephone Subsystem

A secure voice communication system was required to provide Blue Flag and remote site personnel with the ability to control wargaming activity and provide maintenance support. The Blue Flag Secure Telephone Subsystem is shown in Figure 2.2-8. A Private Automated Branch Exchange (PABX) and ring generators were provided to accommodate eight voice lines for the eight remote sites (64 lines) and 32 local telephones at the Blue Flag Hub. Standard telephones or data system compatible with a voice grade interface may be connected to the exchange system. Station numbers, and the number of lines to each site are configurable. Call pick-up, automatic call-back, call hold, off-hook direct connect, call transfer, and other common PABX services are supported. Thirty telephones and two facsimile machines were provided with the hub equipment. Seven telephones and one facsimile machines were provided with each remote site kit.
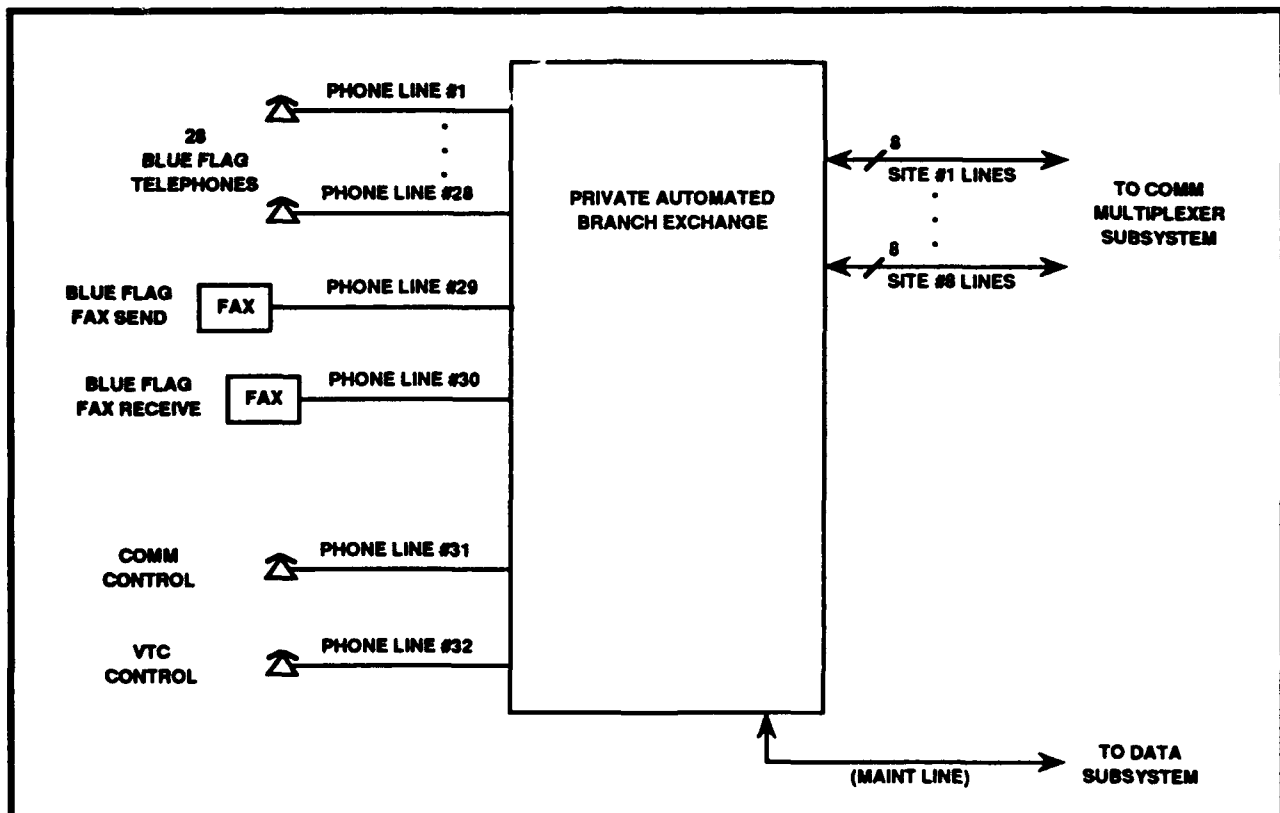
Figure 2.2-8. Secure Telephone Subsystem Major Components.

2.2.5.1 Private Branch Exchange

A Redcom PABX and Ring Generator were provided to accommodate the eight voice lines from each of the eight remote sites (64 lines) and 32 local telephone lines at the Blue Flag Hub Complex. This PABX supports a total of 96 telephone lines. The Ring Generator provides ringing voltage for the telephones. Quick connect, RJ-11 connector blocks were provided on the rear of the PABX rack for connecting the telephones.

Table 2.2-L Blue Flag DWS Dialing Plan

Function	Hub	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Site Commander	900	100	200	300	400	500	600	700	800
Game Pos #1	901	101	201	301	401	501	601	701	801
Game Pos #2	902	102	202	302	402	502	602	702	802
Game Pos #3	903	103	203	303	403	503	603	703	803
Game Pos #4	904	104	204	304	404	504	604	704	804
Game Pos #6	906								
Game Pos #7	907								
Game Pos #8	908								
•									
Game Pos #25	925								
VTC Suite	930	130	230	330	430	530	630	730	830
VTC Suite 2, Hub	931								
Fax	950	150	250·	350	450	550	650	750	850
Fax 2, Hub	951								
Network Control	940	140	240	340	440	540	640	740	840
VTC Control	941								

2.2.5.2 Telephones

Sixty-five DTMF telephones were provided. Thirty were provided for the hub and seven for each remote. One telephone at each remote is built into the Terminal Case and mounted next to the Maintenance Terminal. A 1000 foot roll of telephone cable, RJ-11 connectors, and a crimp tool were provided for installation of the telephones at the hub and at each remote site. The telephone cables are cut to length and connectors added during on-site installation.

2.2.5.3 Fax Machines

Two Panafax Group 3 facsimile machines were provided for the hub and one for each remote site. The facsimile machines have a handset and may be used as a telephone.

2.2.6 External System Interfaces

An additional interface is supplied to extend the use of the DWS secure communication transport capability to external systems. This is accomplished through the use of RS-232 serial interface I/O ports on the communication multiplexer. These ports provided connectivity to the CAFMS system during Blue Flag 92-1.

The CAFMS Subsystem provides connectivity for eight CAFMS circuits from the CAFMS Van at the Blue Flag Hub Complex to a CAFMS Terminal at each remote site. The CAFMS Van and terminals were Government furnished. The eight RS-232 asynchronous CAFMS interfaces were extended from the Blue Flag Computer Room to the CAFMS Van via a 100 meter fiber optic cable and ODS eight-port fiber optic modems. The CAFMS Terminals connect to the remote site communication multiplexer. E-Systems provided the interface cables for the CAFMS Van and 25-foot CAFMS Terminals. Figure 2.2-9 shows the CAFMS Subsystem.

2.2.7 Miscellaneous Equipment

2.2.7.1 Cable Set

A set of internal interface cables was provided. The number of separate cables needed to interconnect the equipment in the suite was minimized and all ports and cable ends were labeled and, where possible, keyed to prevent inadvertent misconnection or misconfiguration. A schematic diagram, affixed within the transit case, shows the interconnection of cables. Appendix A of this document contains the communication hub schematic diagram and Appendix B contains the remote site kit schematic diagram. Additionally, a 100-foot cable for the VTC Suite and 25-foot CAFMS Terminal cable were provided. Telephone cable was provided as previously discussed in Paragraph 2.2.4.3.

2.2.7.2 Test Equipment

A Bit Error Rate Tester (BERT), .Oscilloscope, Transmission Impairment Measurement Set (TIMS), Fiber Optic Source, Fiber Optic Tester, Electronics Toolkit, a Multimeter, and Crimp Tool were provided at the Blue Flag Hub Complex.

A Fiber Optic Tester, Electronics Toolkit, a Multimeter, and Crimp Tools were provided with each Blue Flag DWS Remote Site Kit.
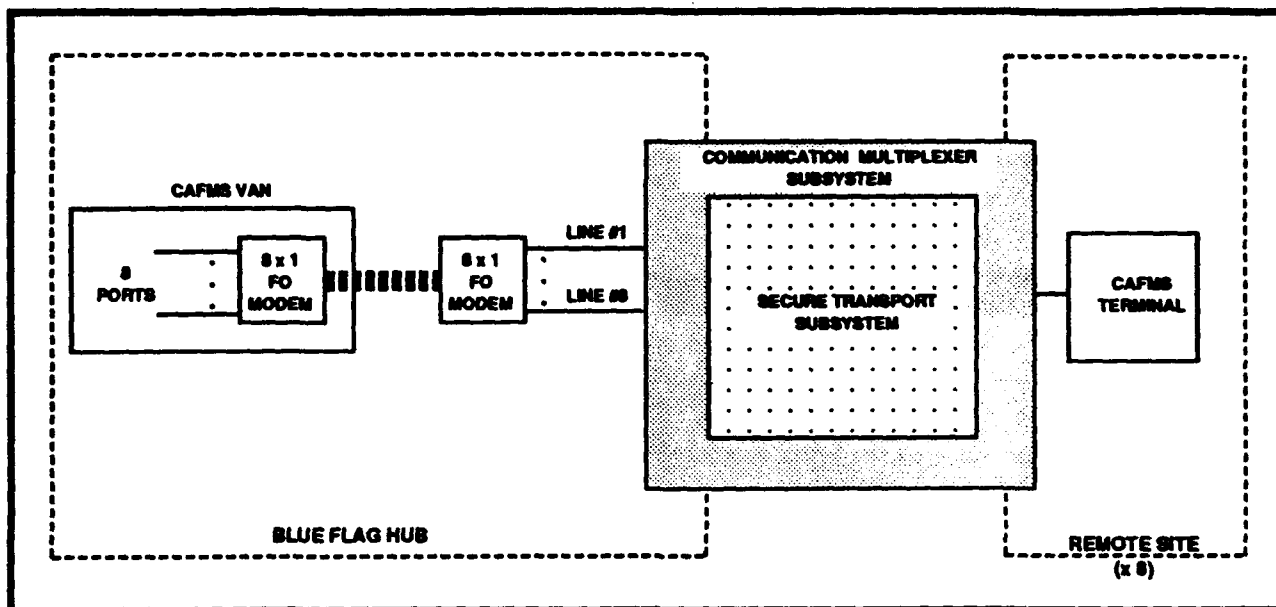
Figure 2.2-9. CAFMS Subsystem Major Components.

3.0   EXERCISE SUPPORT AND INSTALLATION

E-Systems installed the Blue Flag DWS and supported it during the BF 92-1 Exercise. The sites supported by Blue Flag 92-1 were the 41st Training Group at Hurlburt Field, Florida; Tactical Training Group, Pacific at Pt. Loma, San Diego, California; the 363rd Fighter Wing, at Shaw AFB, South Carolina; the 33rd Fighter Wing, at Eglin AFB, Florida; and the Army Site, located to Hurlburt Field, Florida, for the exercise. Figure 3.0-1 presents the overall network configuration for exercise Blue Flag 92-1. The paragraphs below summarize the site configurations as installed, for the exercise.
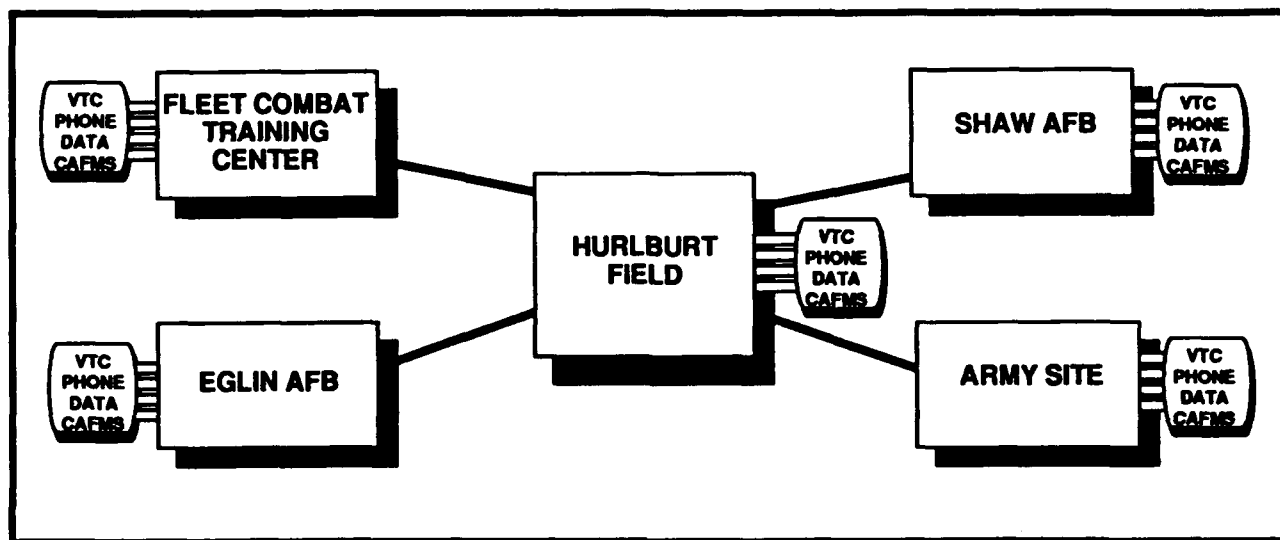
Figure 3.0-1. Blue Flag Exercise BF 92-1 Sites.

3.1   Program Reviews and Site Surveys

E-Systems participated in the Program Kick-Off Meeting in mid-October 1991 at Hurlburt Field. E-Systems presented the Program Plan and performed the Hurlburt Field site survey. This site survey determined equipment placement, power availability, and interfaces to the long-haul communication circuits and CAFMS Van. Site survey information for the three BF 92-1 remote sites was presented to E-Systems by Blue Flag at this meeting. E-Systems used this information to create the BF 92-1 Installation Plan.

In November 1991, E-Systems participated in a Program Review at Hurlburt Field and presented the BF 92-1 Installation Plan and remaining system issues.

3.2   Site Installation

E-Systems installed and maintained the Blue Flag DWS for the BF 92-1 Exercise in January 92. The E-Systems hub installation team of four installed, powered up and tested the rack equipment, Hub VTC Suites and miscellaneous equipment. E-Systems installation personnel installed each of the three remote sites. The DWS Processor was installed in December by DEC personnel.

E-Systems personnel arrived at the hub and remote sites on 6 January 1992 to perform the installations. Blue Flag personnel witnessed and verified inventories of the equipment. Appendix C is the hub inventory and Appendix D is the remote site inventories. The installation team unpacked, powered up, and tested the communication equipment. After the communication equipment was tested, E-Systems connected to the GFE communication circuits. The GFE communication circuits were activated on 6 through 9 January 1992. E-Systems then installed and tested the telephone system and VTC system. E-Systems assisted Blue Flag personnel in installing the GFE terminal equipment at the remote sites. E-Systems created and implemented a site activation checklist during installation included in Appendix C. Government personnel were on-site to assist E-Systems with testing and to receive on-the-job training.

3.3 Operational Testing

E-Systems conducted an operational test of the equipment as part of the system installation. Operational testing was conducted the week prior to the BF 92-1 Exercise (8-10 January 1992). The remote site installation checklist is provided in Appendix E.

3.4 Support and Training

E-Systems provided on-site, on-the-job training for Blue Flag personnel at Hurlburt Field and the three remote sites during installation, operational testing, and the BF 92-1 Exercise. Pre-exercise system training was conducted on 13-15 January 1992. The on-the-job training was performed by the E-Systems installation team. A list of the commercial manuals provided is provided in Appendix F.

3.5 HURLBURT FIELD SITE, FLORIDA

Blue Flag 92-1 was conducted in the player areas in Building 90005 at Hurlburt Field. The hub communication equipment was installed in the Blue Flag Computer Room, located along the south wall of the building. Figure 3.5-2 shows the configuration of Building 90005. The controllers terminals were located in the WOC and BDA areas just outside the Computer Room. Players were located in the large hanger area, in the center of the building. The telephone room and frame room, referenced in following paragraphs, are also shown in the figure. The interfaces of the Blue Flag DWS communication equipment to the existing Blue Flag facility are described below.

3.5.1 Hub Communication Equipment

The Blue Flag hub communication equipment, consisting of one BLACK Communication Rack and two RED Communication Racks was installed in the northeast corner of the Computer Room, adjacent to the existing Video Teleconferencing Multiplexer. The layout of the Computer Room is shown in Figure 3.5-2.
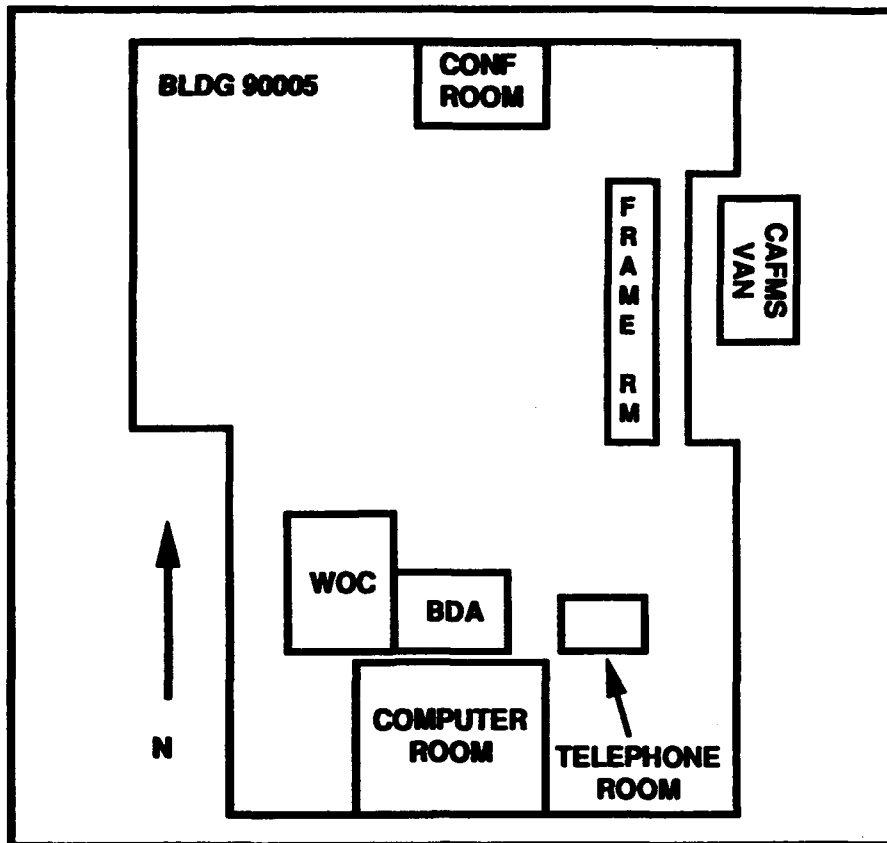
Figure 3.5-1. Hurlburt Field Site Configuration

Power for VTC Multiplexer and Communication Racks was connected to existing power cables are run under the raised floor to the Blue Flag UPS unit on the south side of the Computer Room. Each equipment rack has a single power cable. Figure 3.5-3 shows the power receptacles located under the floor tiles. Figure 3.5-3 also shows which rack was plugged to each receptacle.

3.5.2 Hub VTC Suite Equipment

The two Hub VTC suites were delivered and installed at the Blue Flag Facility. One of the suites was installed in the main conference room, on the north wall of Building 90005. The second hub VTC suite was placed in the BDA area just outside the Computer Room. Both were corrected to the VTC multiplexer system via fiber optic modems and cables.

3.5.3 Facility Interfaces

The following paragraphs describe the method of interconnection of the communication equipment supplied to Blue Flag with the existing facility equipment.
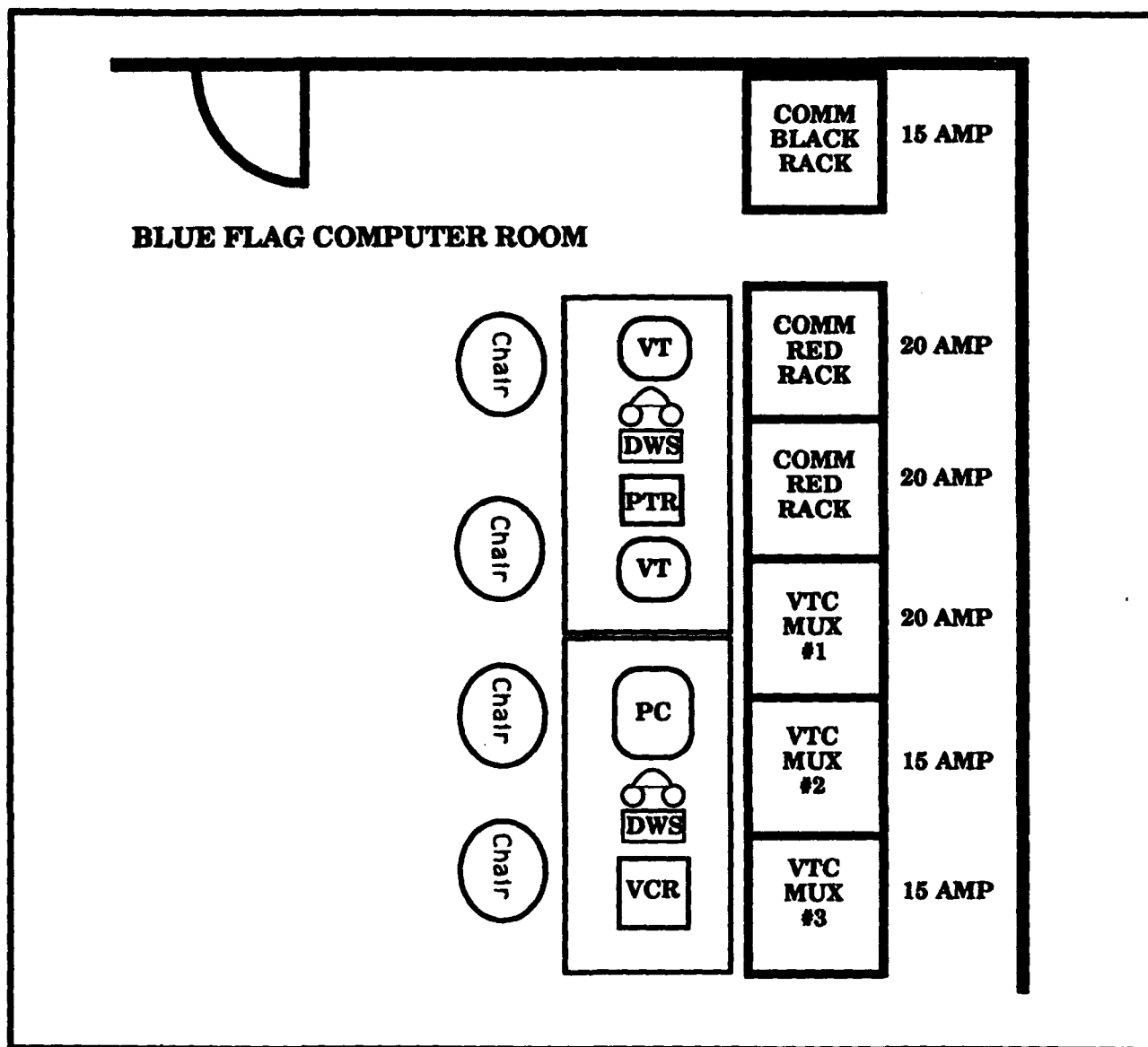
Figure 3.5-2. Blue Flag Hub Communication Equipment Placement

3.5.3.1 Computer Room Egress

Egress to the Computer Room for the BLACK T1 circuits was through a conductive conduit from the Telephone Room to the Black Communication Rack within the Computer Room. Access to the Telephone Room is obtained from the hallway at the Northeast corner of the Computer Room. All RED access to the Computer Room is through a cable closet located on the north wall.

COMM BLACK RACK

COMM RED RACK
①
⑧

COMM RED RACK

VTC MUX #1
②
③

VTC MUX #2
④
⑤

VTC MUX #3
⑥
⑦

#1 - A50 - 15 AMP - STANDARD PLUG
    COMM BLACK RACK

#2 - A40 - 15 AMP - STANDARD PLUG
    VTC MUX RACK #2

#3 - DWS1 - 30AMP - NEMA L6-30
    COMM RED RACK #1

#4 - DWS2 - 30 AMP - NEMA L5-30-R
    COMM RED RACK #2

#5 - DWS3 - 30 AMP - NEMA L5-30-R
    VTC MUX RACK #1

#6 - A34 - 15 AMP - STANDARD PLUG
    VTC MUX RACK #3

#7 - A33 - 15 AMP - STANDARD PLUG

#8 - DWS4 - 15 AMP - STANDARD PLUG
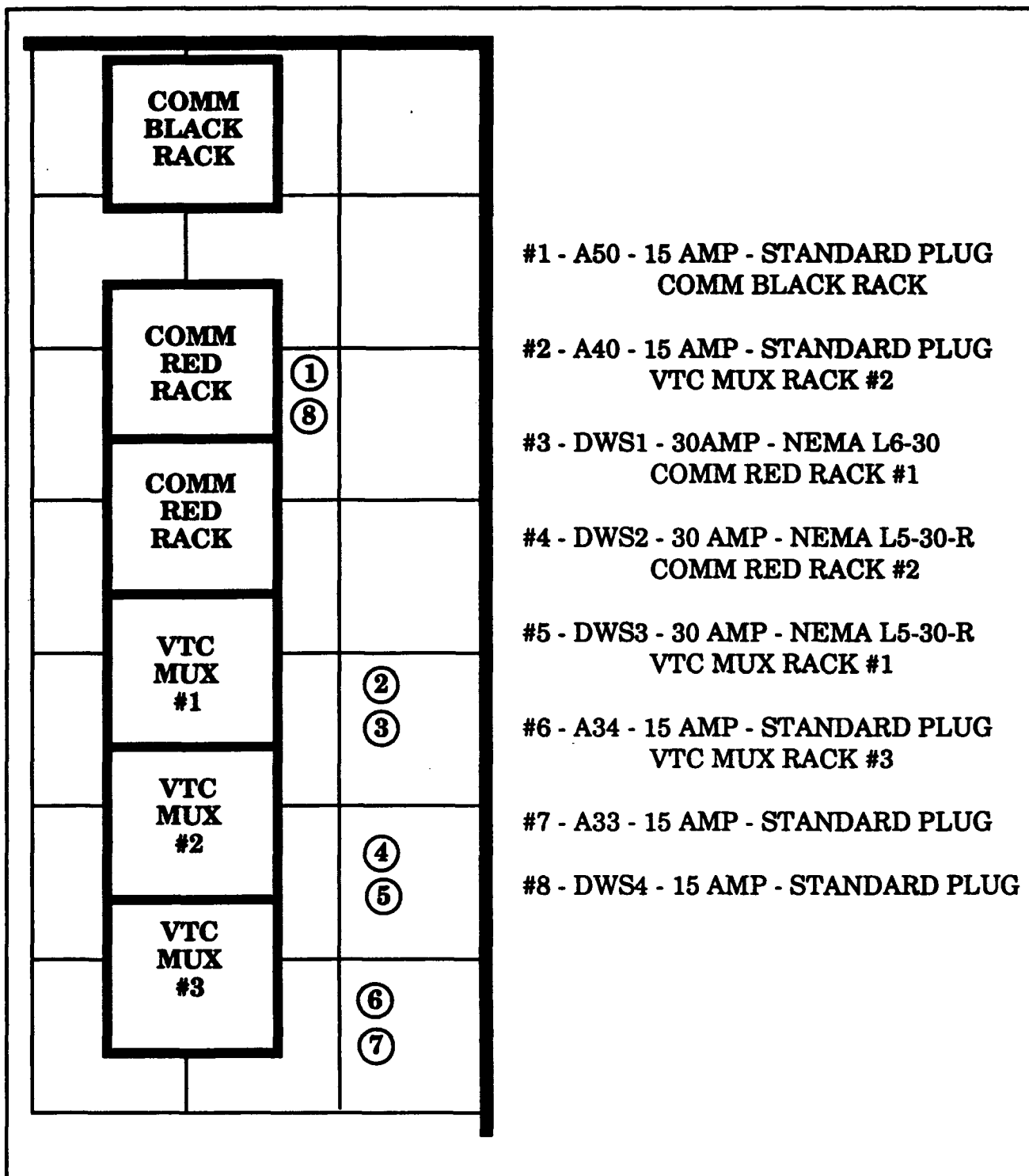
Figure 3.5-3. Computer Room DWS Power Receptacles.

3.5.3.2   Long Haul Circuits

All long haul communication circuits terminated at the Hurlburt Field Dial Central Office (DCO). The T1 circuits were then extended to the Blue Flag Computer Room, in Building 90005, by a secondary network circuit via CSUs placed at the DCO. The overall configuration of the long haul communication network, from Hurlburt to the remote sites, is shown in Figure 3.5-4. Both the Eglin AFB fiber optic circuit and the Pt. Loma AT&T circuit were terminated with Blue Flag supplied CSUs. The Shaw AFB circuit, operating over the AFNET system was terminated with an E-Systems supplied DSU/CSU (removed from the hub equipment). The network end of each of these CSUs was then connected to a four-wire line (two pair of twisted pair wire), supplied by Blue Flag, leading to the Telephone Room in Building 90005. Two CSUs were placed back-to-back (at the DCO) on the Pt. Loma circuit, with the Network port of one CSU connected to the AT&T circuit, and the network port of the second CSU connected to the four wire line to Building 9005. The four-wire circuits were terminated on a 66 series connector block in the telephone room. This was the point-of-presence (POP) presented to E-Systems.

Two 25-pair cables were run (one for transmit, one for receive) within conduit from the Telephone Room to the BLACK Communication Rack within the Computer Room. The cables were terminated in the Telephone Room on a dedicated 66-series block just below the block on which the wire-pairs to the DCO were terminated. The other end of the cables were terminated on a RJ-45 patch panel mounted in the BLACK Communication Rack. E-Systems punched down wires connecting the two 66 blocks in the telephone room and continuing the circuits to the BLACK Communication Rack. Patches were then made from the T1 patch panel to the appropriate DSU/CSUs to complete the circuits. The overall communication interface is shown in Figure 3.5-4.

3.5.3.3   Telephone Circuits

A telephone circuit interconnection diagram in shown in Figure 3.5-5. The interconnection point for the telephone system is two series 66 blocks mounted on the rear of RED Communication Rack. Each block contains 25 telephone pair which are patched into the blocks via the local telephone patch panel on the rear of the same rack. The local telephone patch panel in combination with the main telephone patch panel, located just above it, allow the 96 available telephone lines to be independently patched to remote sites or into the Blue Flag facility. Nominally, twenty-seven telephones lines were patched into the local facility, and two telephone lines and one fax line were located in the Computer Room, totaling 32 telephones at the hub. Eight telephones were patched to each of the remote sites. The remaining telephone lines were unused.
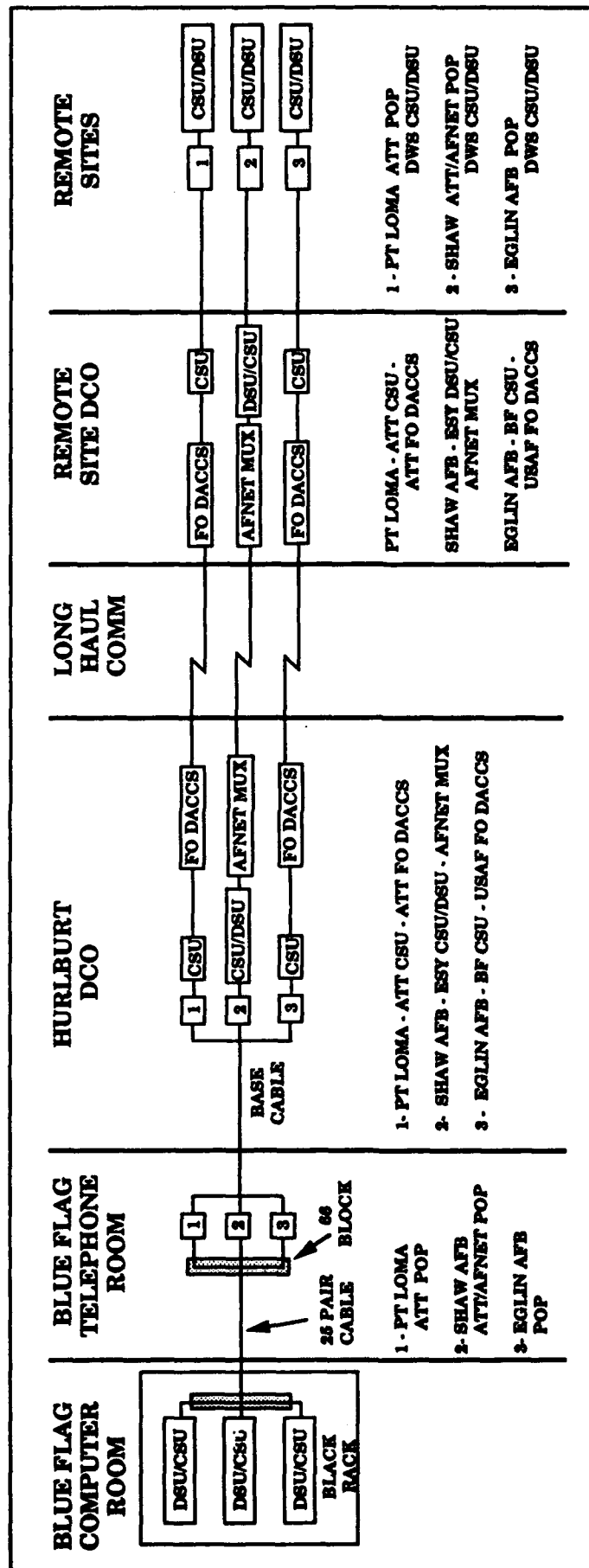
Figure 3.5-4. Long Haul Communication Connectivity
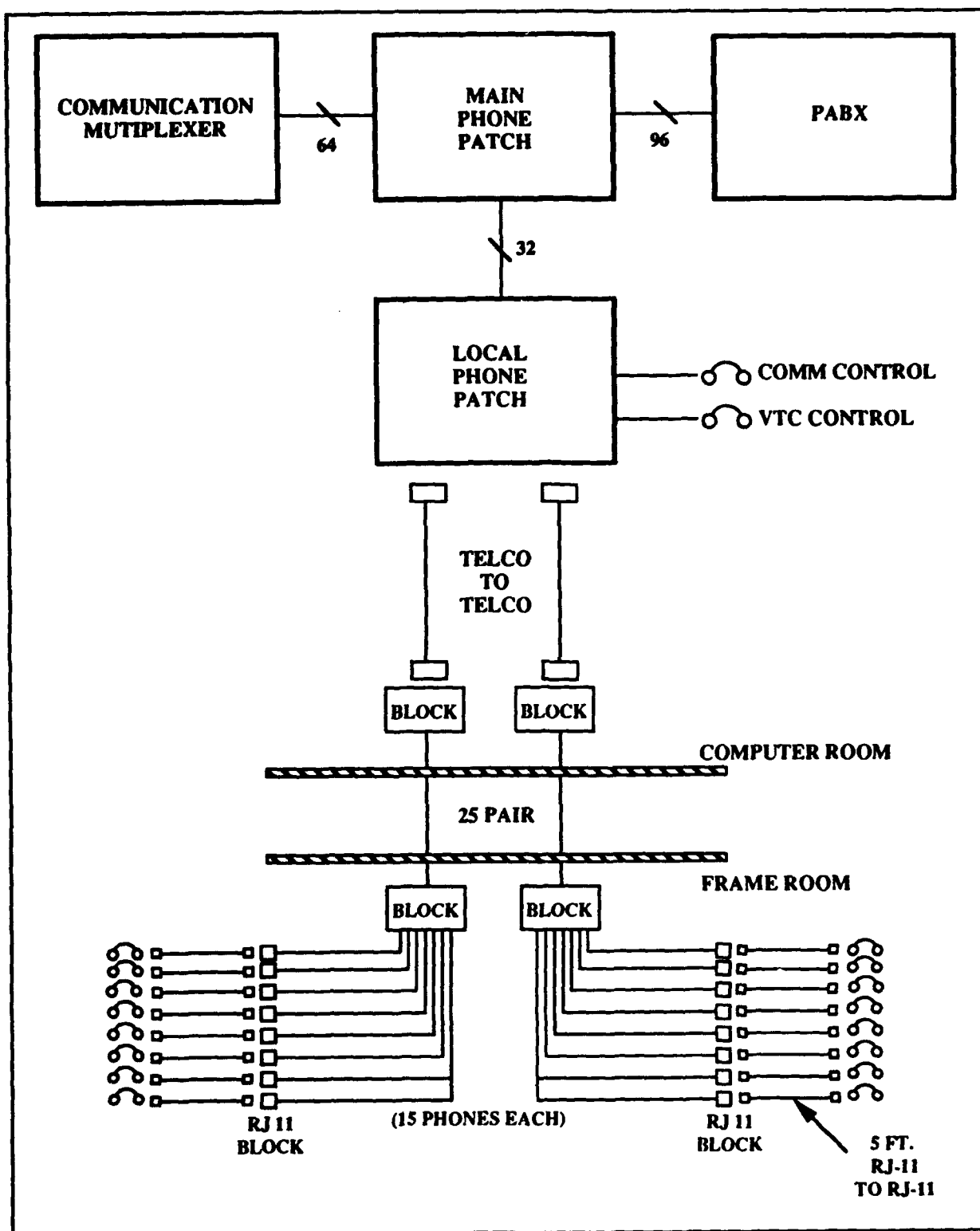
Figure 3.5-5. Hurlburt Field Telephone System.

Two Blue Flag supplied 25-pair cables were connected to the telephone blocks by E-Systems. The cables terminated at the telephone patch board located in the frame room at the east end of Building 90005. At this location Blue Flag personnel performed the necessary cross connections to route the telephone lines throughout the Blue Flag facility. During installation it was discovered that these two cables were actually four cables spliced together by two additional 66 blocks located beneath the computer floor by the computer network equipment, just west of the north door.

3.5.3.4   Data Interface (Ethernet connection)

The interface between the DWS equipment and the Blue Flag data network is an ethernet tap connecting the Blue Flag backbone to the DWS Digital Ethernet Lan Network Interconnect (DELNI). The DELNI is located in RED Communication Rack. The ethernet tap is below the Computer Room floor, in front of the east door. A transceiver cable connects the transceiver at the ethernet tap to the DELNI.

3.5.3.5   VTC Suite Interface

The Blue Flag VTC Equipment connectivity at Hurlburt Field is show in Figure 3.5-6. The primary Hub VTC Suites were connected to the Blue Flag hub equipment by means of fiber optic cable. A 100 meter length of cable was used for the VTC suite in the Blue Flag Conference Room and a 20 meter cable was used to connect the suite in the BDA area. The VTC suites were connected to the number six and number seven codecs mounted in the Computer Room.

A Government furnished VCR was connected to the VTC Multiplexer system in the Computer Room using "Local Suite 1" video and audio inputs/outputs.
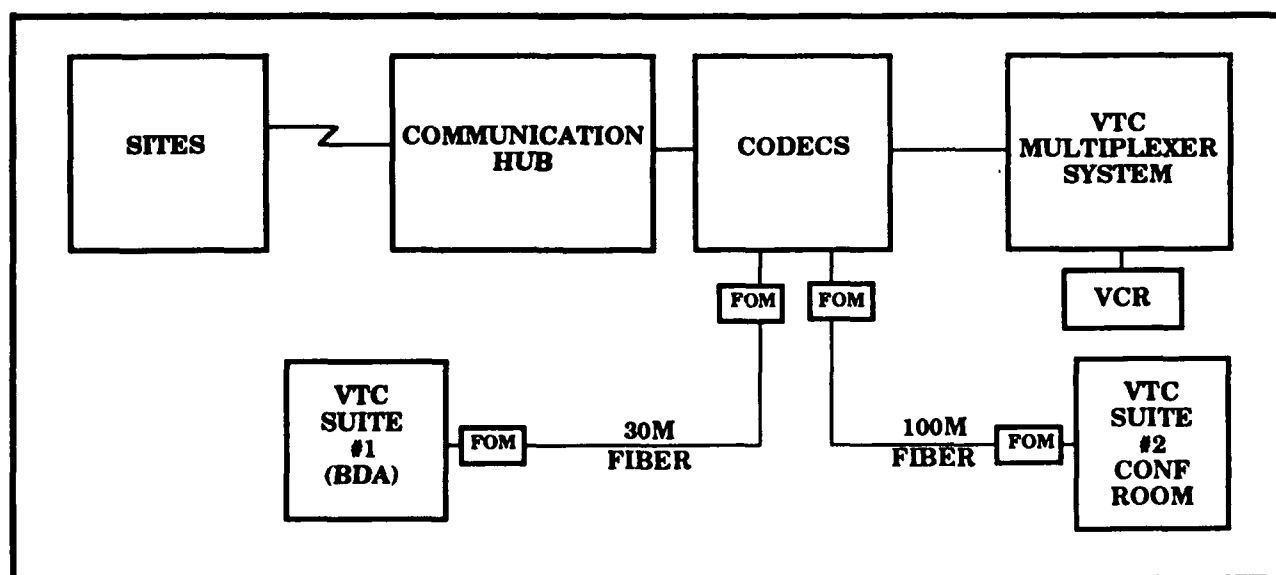
Figure 3.5-6. Hurlburt Field VTC Equipment Connectivity

3.5.3.6   CAFMS System Interfaces

Eight asynchronous CAFMS lines were provided to the DWS system as shown in Figure 3.5-7. A fiber optic cable connected an ODS 306 RS-232 Multiplexer with a similar ODS 306 mounted in RED Communication Rack. These multiplexers extended the local CAFMS asynchronous lines from the CAFMS Van to the DWS equipment. Four of the CAFMS lines were connected directly to the communication multiplexer for connection to the remote sites. Shaw AFB and Eglin AFB each received one of these CAFMS lines. Pt. Loma originally received one, but one was removed from the Army site and supplied to Pt. Loma due to heavy use. At the remote end, a CAFMS terminal was connected directly to the communication multiplexer, thus completing the CAFMS circuit.

The remaining six asynchronous lines from the ODS 306 multiplexer were connected directly to a Blue Flag supplied Xyplex terminal server. The server was programmed to offer the CAFMS lines as services over the ethernet network. Two of these lines were used by the Army site (one in replacement for the one borrowed for Point Loma), and the remaining four were used in the gaming area at Hurlburt.

These configurations used the CAFMS terminals in their asynchronous or "local" mode. Normally, local CAFMS terminals were used only at Hurlburt, either by connecting the lines to the ethernet as described above, or by using ODS 108 DTE/DCE fiber optic modems and fiber optic cable to connect the CAFMS terminals to the CAFMS van. Under the DWS configuration, the local lines were extended to the remote sites by two methods: (1) directly through the communication multiplexer, or (2) by direct connection to the ethernet and thereby, to the remote sites via the Computer Data Subsystem. The ODS 108 modems were not required. Use of the KG-84As and Codex 2340 modems, at both the remote sites and in the CAFMS van, to provide synchronous secure connections between the remote sites and the CAFMS van at Hurlburt, was also not required.

At Shaw AFB, it was attempted to use the Codex 2340 modems to extend the distance the CAFMS terminal was located from the DWS equipment. This attempt did not prove to be successful since the Codex 2340 modems did not appear to execute the proper handshake signalling with the Zenith CAFMS terminals. Since the CAFMS terminals were designed to operate in this manner, this configuration warrants further investigation.

3.5.3.7   Other External System Interfaces

3.5.3.7.1   AWSIMS

The AWSIMS work stations were connected to the hub ethernet spine. They established communication with the VAX 6640 processor over the ethernet. Remote AWSIMS terminals established communication with the VAX 6640 processor via the wide-area network established by the DWS Data Subsystem.
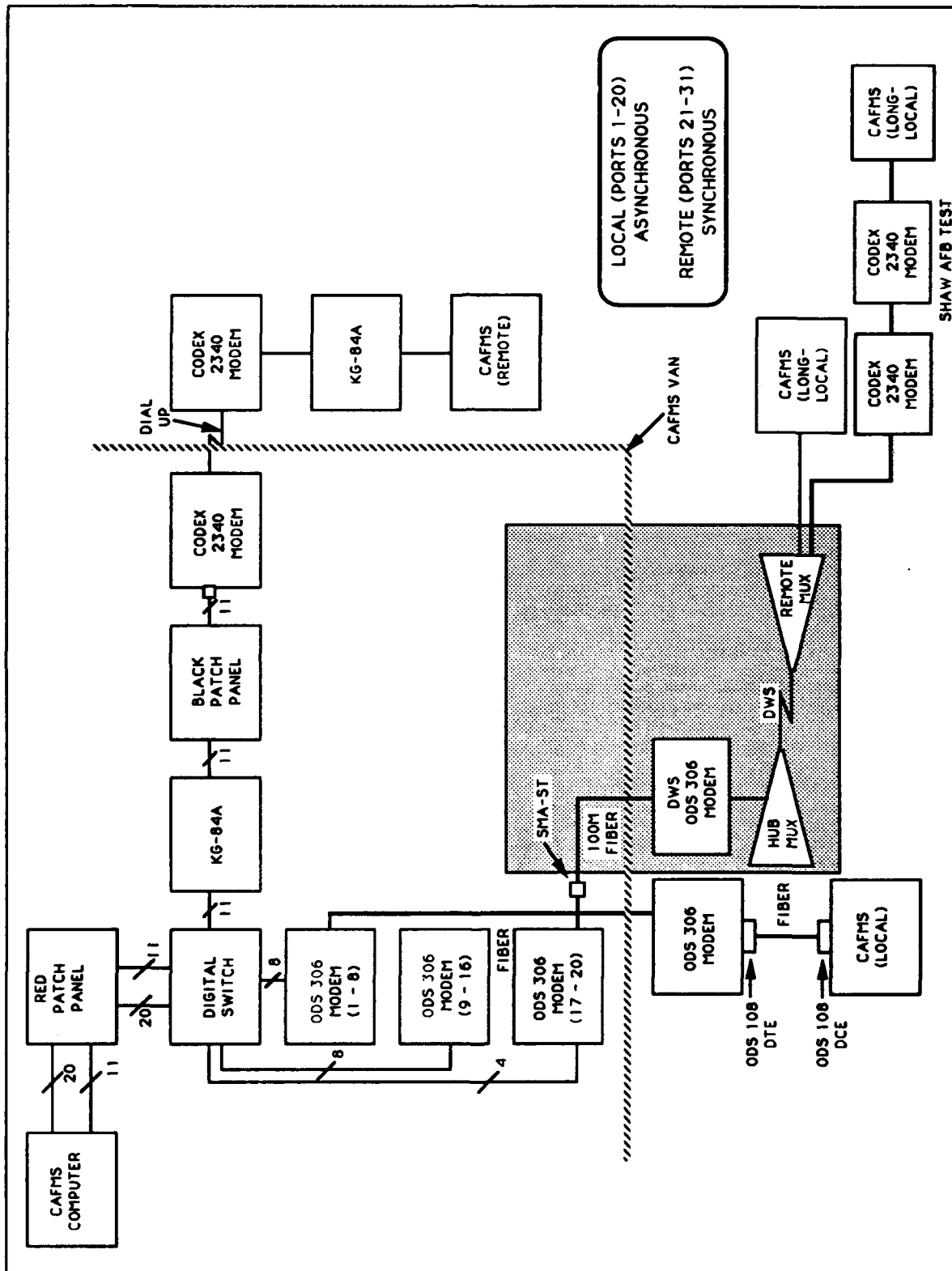
Figure 3.5-7. DWS CAFMS Connectivity.

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3.5.3.7.2   SACSS

The Stand Alone Communication Subsystem (SACSS) consists of a MicroVax located at the Blue Flag Hub and a TEMPEST VT-220 located at each remote site. The MicroVax was attached to the Blue Flag Hub ethernet. The remote site SACSS VT-220 terminals were connected to the DWS Terminal Server. E-Systems built the MMJ to RJ-45 cables on site.

The SACSS MicroVax computer (located in the Blue Flag Computer Room) communicated with local SACSS terminals (TEMPEST VT-220s) via the ethernet. Communication with SACSS terminals located remotely was accomplished via the wide-area network established by the DWS Data Subsystem.

3.5.3.7.3   Sentinel Byte

The Sentinel Byte terminals (Sun Sparc workstations) were connected directly to the hub ethernet. They established links to their remote counterparts via the wide-area network established by the DWS Data Subsystem. This marks the first time that Sentinel Byte workstations used an ethernet port for communication, rather than a serial RS-232 port.

3.5.3.7.4   STU-III

STU-IIIs were connected to the DWS Telephone Subsystem. They operated as designed.

3.5.3.7.5   DIVITS

DIVITS terminals were connected directly to the data port on STU-IIIs. DIVITS circuits were established from Hurlburt Field to Shaw AFB. A DIVITS connection was not established to Pt. Loma due to security concerns involving the physical connectivity at that site. Eglin AFB did not have a DIVITS terminal.

The DIVITS data was encrypted prior to entering the DWS system. This meant that DIVITS data underwent a double encryption/decryption processes. The only problem that was encountered was a malfunctioning DIVITS terminal at Shaw AFB, which was replaced.

3.5.3.7.6   FCC-100

A pair of FCC-100 were connected between the Blue Flag Hub and Eglin AFB to interface the TRI-TAC TTC-39 via the DWS. The system operated correctly.

3.6 TACTICAL TRAINING GROUP PACIFIC, PT. LOMA

The functional site layout for Point Loma is represented in Figure 3.6-1. The exercise location was Building 58, the Computer Room and Classroom #2. These rooms were in the basement of the building. Connectivity between Hurlburt Field and Pt. Loma was via an AT&T T1 circuit. The AT&T point-of-presence (POP) was located in the telephone room just outside Building 58. Although the POP was not within the specified 5 meters of the BLACK communication equipment, and was not terminated with the specified 4-wire termination block (E-Box), the E-Systems on-site engineer was able to construct an appropriate cable. The Communication Case and the Multiplexer Case were placed along the wall of the Computer Room. A second set of cases from a second suite were located adjacent to the first two, to serve as spares. Two-pair twisted-pair wire cable was used to connect the Communication Case to the AT&T POP.

The player area, in Classroom #2, was across the hall from the Computer Room. The telephone line and ethernet transceiver runs between the two rooms were run through two 2-inch conduits connecting the rooms. The physical layout of the player room is presented in Figure 3.6-2.

The terminal case, containing the LAN Interconnect (DELNI) and terminal server, was placed on a table directly at the end of the conduit. The DELNI was connected to the Vitalink TransLAN and the Multiplexer Case by a forty foot transceiver cable. The CAFMS Terminal was placed next to the Terminal Case, and was connected directly to the communication multiplexer by the fifty foot serial cable. During the exercise, an additional CAFMS Terminal was added in a similar manner. Other terminals, work stations and telephones were placed as shown, against the wall. The workstations were connected to the DELNI via transceiver cables. The terminals were connected to the terminal server by silver satin cable. The telephones were connected directly to the communication multiplexer by silver satin cable.

The VTC suite was placed behind partitions in the corner of the room. The VTC equipment was connected to the communication multiplexer by the one-hundred foot RS-449 cable supplied with the kit. A second VTC suite from the second remote kit was placed adjacent to the first, as a spare.
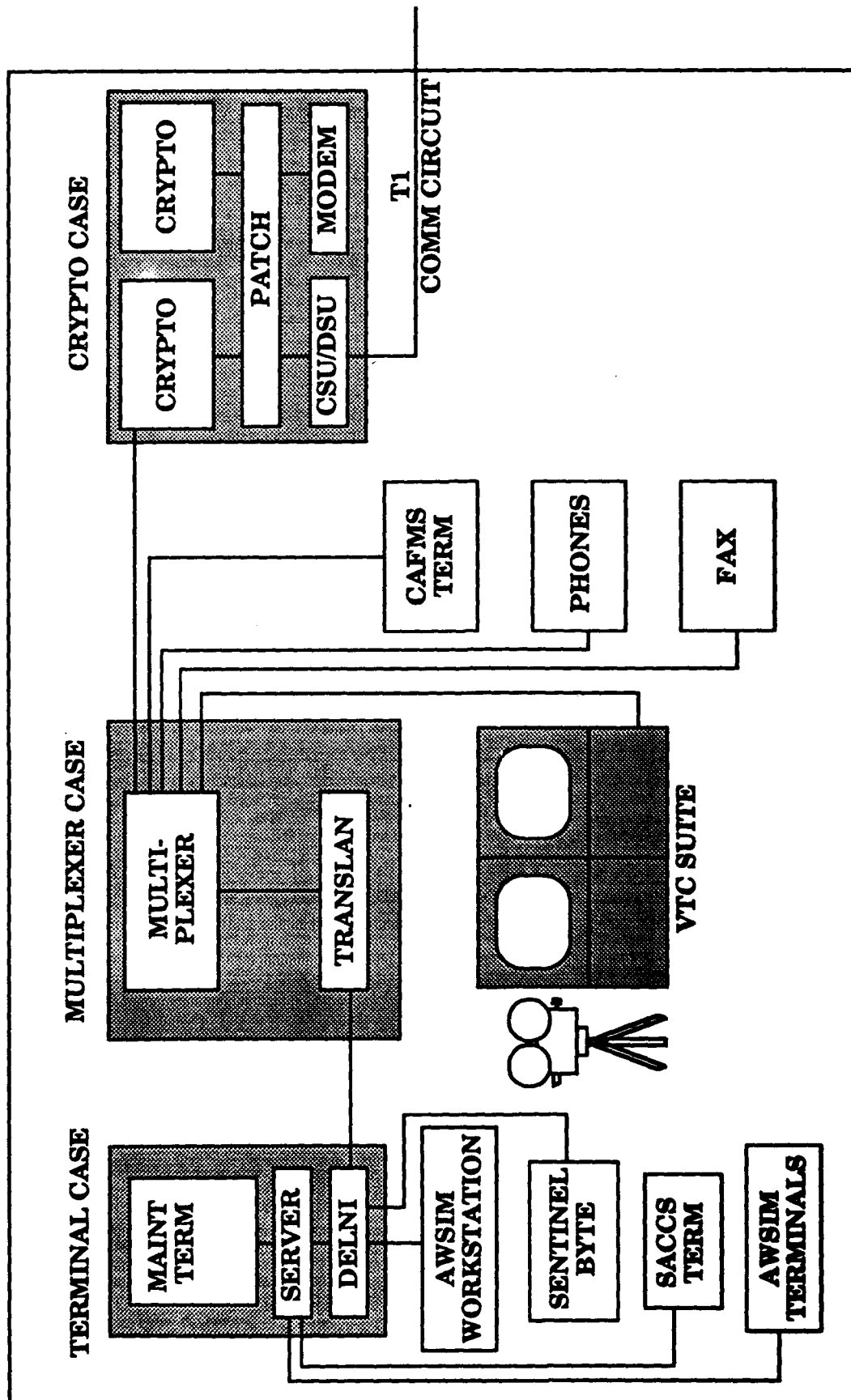
Figure 3.6-1. Typical DWS Remote Site Configuration.
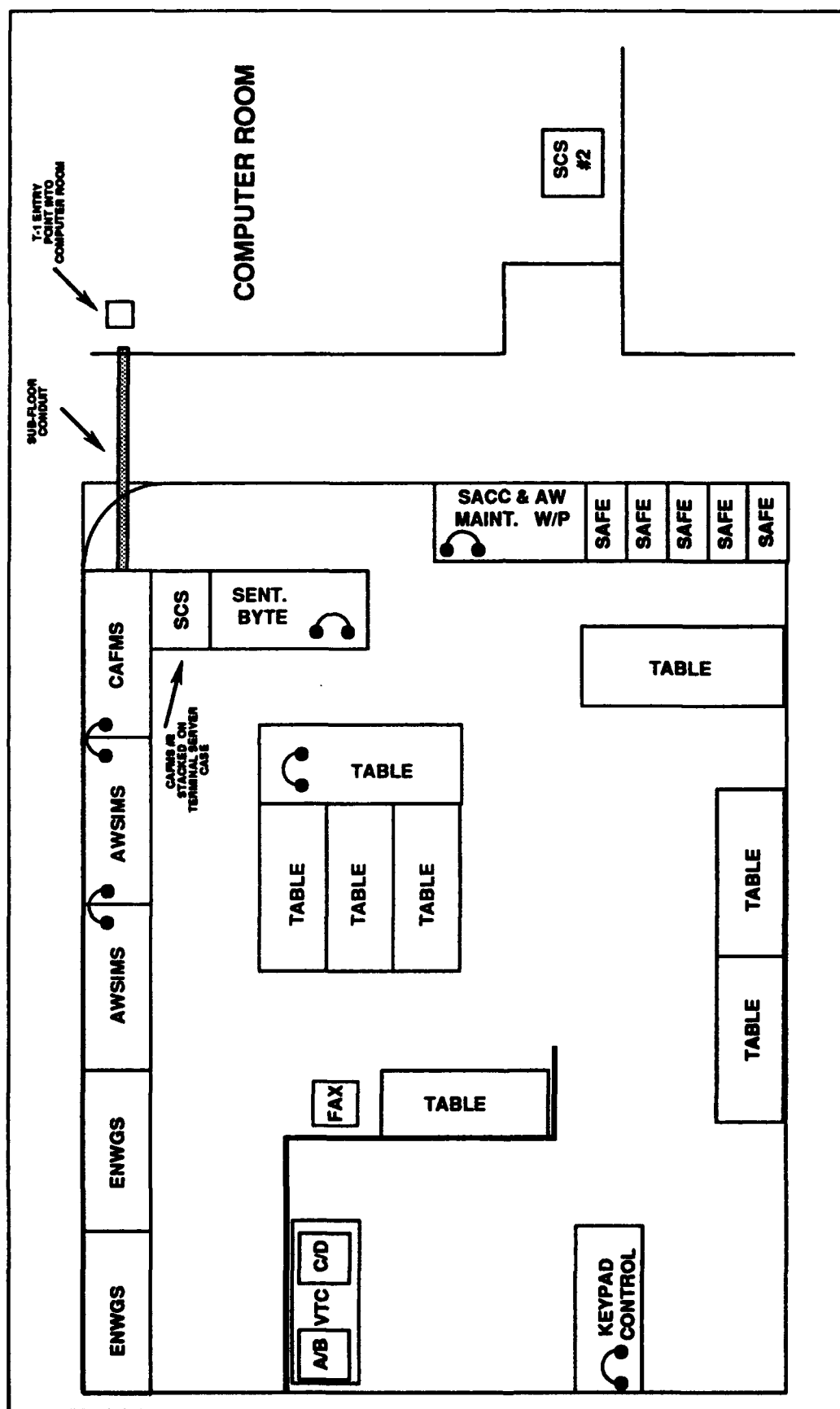
Figure 3.6-2. Pt Loma Remote Site.

3.7   363rd FIGHTER WING, SHAW AFB, SOUTH CAROLINA

The Shaw A.. exercise location was Building 1122, Room 33. Connectivity between Hurlburt Field and Shaw AFB was via an AFNET circuit operating at 1.344 Mbits/second. E-Systems and Blue Flag were the first users of the Air Force owned and operated AFNET system. The AFNET point-of-presence was located in the Telephone Communication Building, Building 1129. The E-Systems demarcation point was a 4-wire interface located adjacent to the SCS. A DSU/CSU removed from the hub rack, was sent with the remote site kit and located next to the AFNET equipment. A four-wire line connecting buildings 1129 and 1122 was terminated at each end by a RJ-45 network interface plug, which was used to connect to the DSU/CSUs. Although the E-Systems demarcation point was the DSU/CSU located within the DWS SCS Communication Case, E-Systems supported the circuit and equipment required to interface to the AFNET node.

The Secure Communication Set (SCS) placed in the center of the room, along the curtain separating the VTC area from the player area. The physical layout of the player room and VTC area is presented in Figure 3.7-1.

The Terminal Case, containing the LAN Interconnect (DELNI) was connected to the Vitalink TransLAN and the Multiplexer Case by the transceiver cable supplied with the remote kit. The CAFMS Terminal was placed next to the SCS, and was connected directly to the communication multiplexer by a fifty foot serial cable. Other terminals, work stations and telephones were placed as shown. The workstations were connected to the DELNI via Blue Flag supplied transceiver cables. The terminals were connected to the terminal server by silver satin cable. The telephones were connected directly to the communication multiplexer by silver satin cable. Silver satin cables were built on-site. The VTC suite was placed behind curtain partitions.
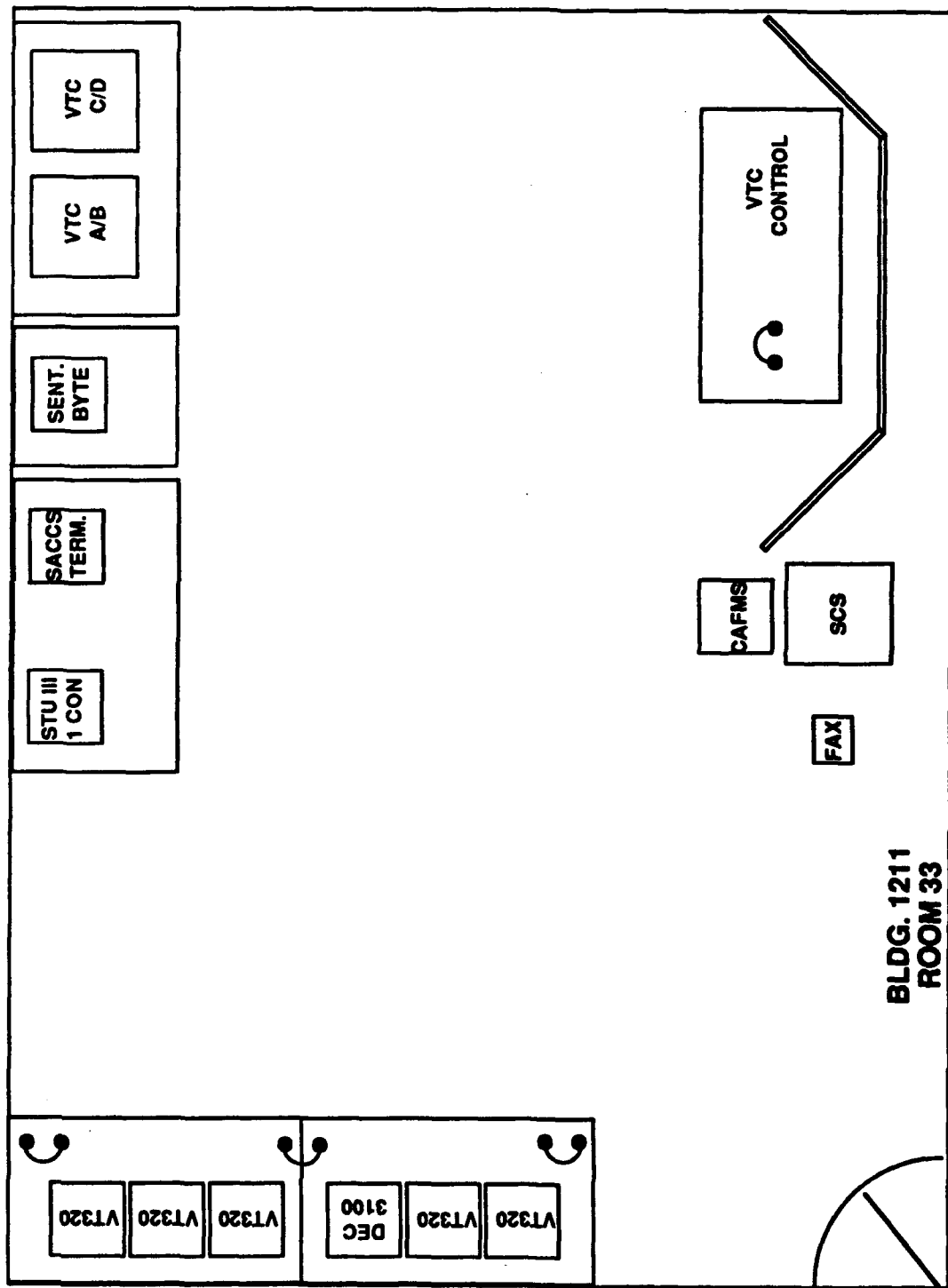
Figure 3.7-1. Shaw AFB Remote Site

BLDG. 1211
ROOM 33

3.8   33rd FIGHTER WING, EGLIN AFB, FLORIDA

Connectivity between Hurlburt Field and the 33rd TFW at Eglin AFB was via the T3 fiber optic circuit installed between the Hurlburt DCO, through the Eglin AFB DCO and terminating at a fiber optic DACS in a patch room (Room 2356) in the rear of Building 1315. Blue Flag furnished CSUs were placed at the Hurlburt DCO and in a patch room at Eglin AFB to extend the supplied circuit to the DWS equipment. A four-wire circuit was provided to extend the fiber optic circuit from Building 1315 to the SCS, located on the second floor of Building 1310. In the patch room the link wires were directly connected to the GFE CSU via the terminal block on the rear of the unit. The other end of this four-wire circuit entered Building 1310, and via a series 66 block, continued on to the second floor, near the SCS, where the four wires were terminated on a E-Systems supplied terminal block. A twisted pair cable was built on-site to connect the terminal block to the DSU/CSU unit located in the SCS. Initial confusion as to the need of a four-wire circuit run, from Building 1315 to Building 1310, delayed actual installation of the CSUs and integration and testing of the T1 circuit. The room originally planed for installation of the CSU was under reconstruction and offered no access to the T1 circuit. The installation was re-engineered by E-Systems on-site and installed the following day, although not according to the site survey. The overall T1 circuit configuration is displayed in Figure 3.8-1. Although the E-Systems demarcation point was the DSU/CSU located within the DWS SCS Communication Case, E-Systems supported the circuit and equipment required to interface to the fiber optic circuit.

The player area at Eglin AFB was located on the second floor of Building 1310. The physical site layout is represented in Figure 3.8-2. The SCS cases, the VTC Suite cases and a Sentinel Byte terminal, were each placed in separate rooms. The remaining player terminals were also placed in a separate room.

The CAFMS terminal was placed in the large player room and was connected directly to the communication multiplexer. Other terminals, work stations and telephones were placed as shown. The workstations were connected to the DELNI via Blue Flag supplied transceiver cables. The terminals were connected to the terminal server by silver satin cable. The telephones were connected directly to the communication multiplexer by silver satin cable. Silver satin cables were built on-site.
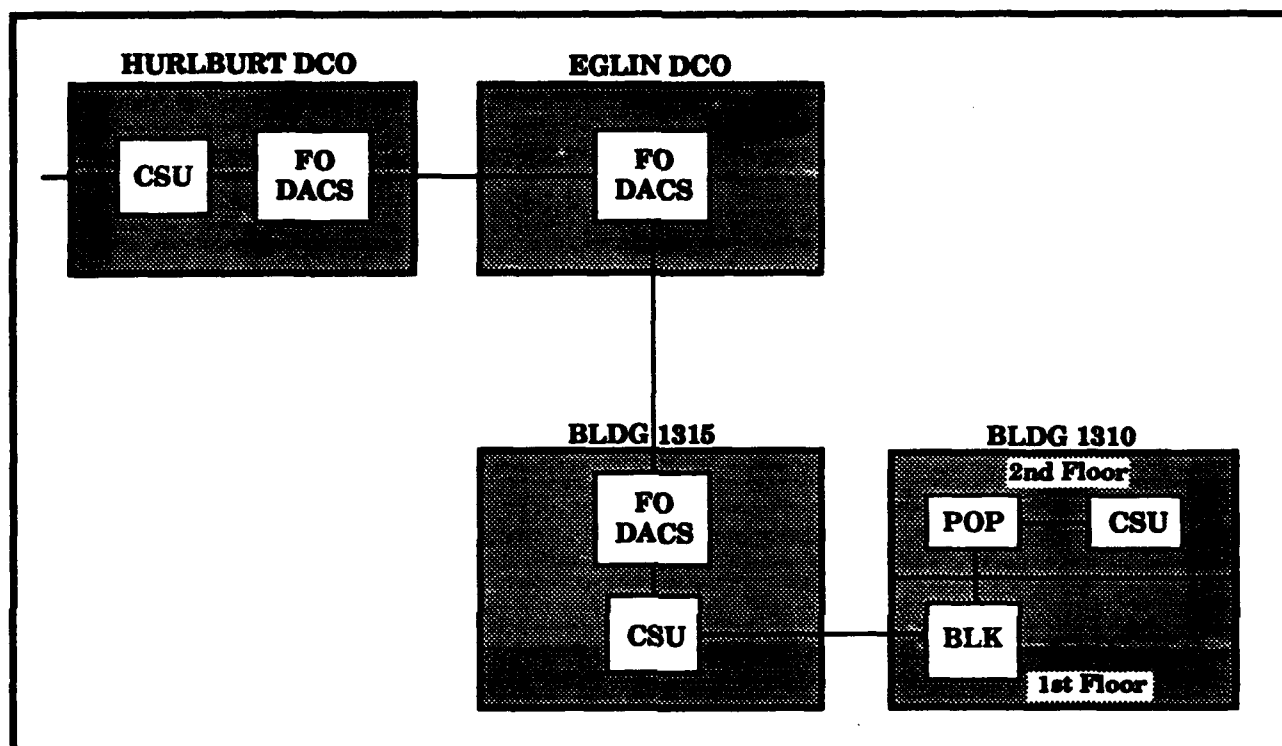
Figure 3.8-1. Eglin AFB Communication Circuit
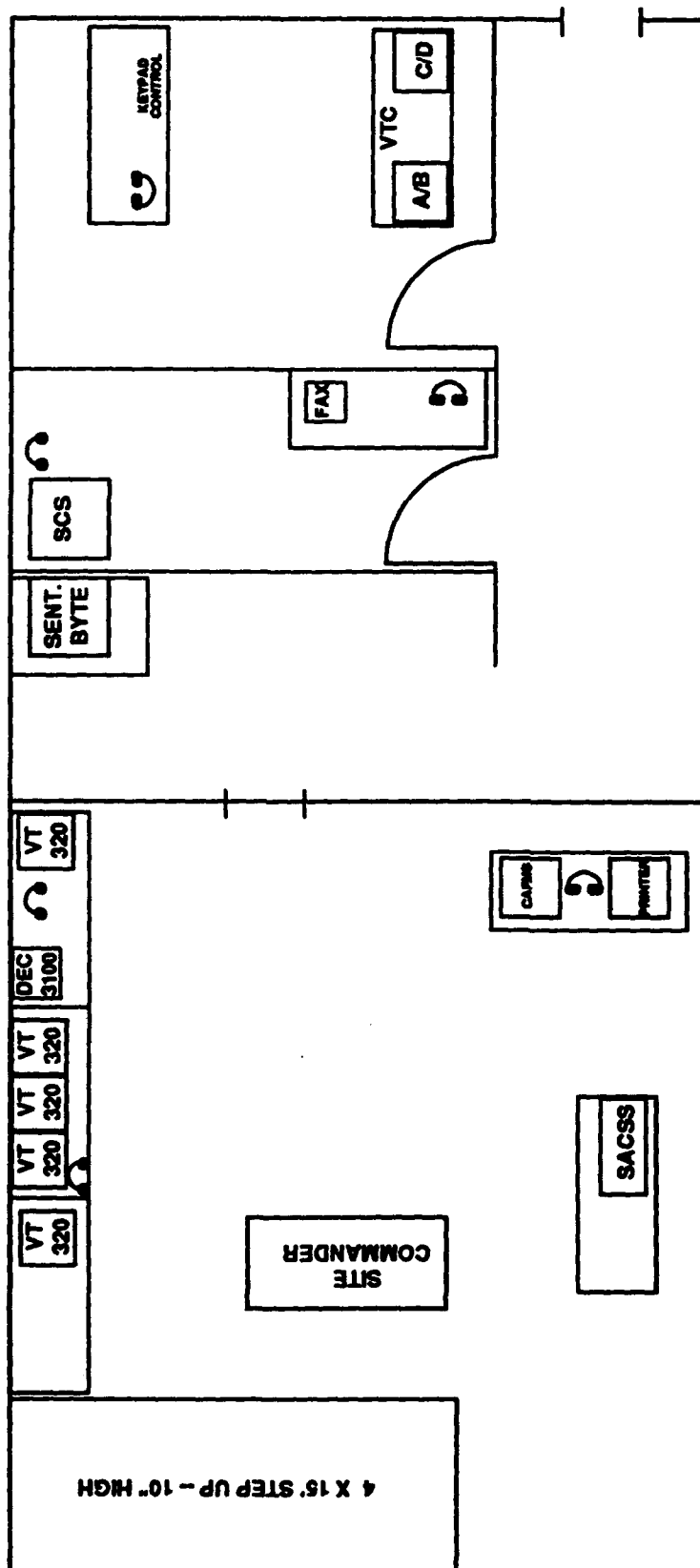
Figure 3.8-2. Eglin AFB Remote Site.

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3.9   ARMY SITE, HURLBURT FIELD

The Army site was at the ARCENT Exercise area located just west of the Blue Flag compound. As no site survey data was available for this location, planning and implementation was performed jointly by E-Systems and Blue Flag personnel. Connectivity between the Blue Flag hub and the Army area was by means of the fiber optic run. The fiber was terminated at the SATCOM modems in the BLACK Communication Rack at the hub, and in the SCS at the army site. The SCS communication cases and the VTC Suite cases were placed in the South Room of the Production trailer (513th) within the compound.

The player area at the Army site was distributed among seven trailers in the immediate vicinity, as shown in Figure 3.9-2. CAFMS circuits were programmed as services at the Xyplex terminal server placed in RED Communication Rack at the hub. The terminal server at the Army site was then programmed to connect to their respective service. Two GUTS terminals were placed in other rooms in the production trailer and connected to the terminal server via silver satin. Two CAFMS terminals and the remaining seven GUTS terminals were routed from the terminal server to various trailers via silver satin or twisted wire RS-232 asynchronous multiplexers used as modems. Table 3.9-I lists the number of terminals and the method of distribution for each trailer. No workstations were deployed at the Army location.

The VTC suite was set up in the south room of the production trailer next to the SCS. Telephones were connected directly to the communication multiplexer by silver satin cable. Silver satin cables were built on-site.

Table 3.9-I. Army Site Terminal Placement

Qty	Terminal Type	Location	Connection Method
1	GUTS	513 TK & DISSEM	MULTIPLEXER#1
1	GUTS	CMD GP	MULTIPLEXER#2
2	GUTS	164th ADA/ASOC	MULTIPLEXER#3
1	CAFMS	164Th ADA/ASOC	MULTIPLEXER#3
1	GUTS	MOBILE CMD POST	MULTIPLEXER#4
1	CAFMS	O & I	SILVER SATIN
1	GUTS	O & I	SILVER SATIN
1	GUTS	AFCEN/G5/11/ADA	SILVER SATIN

4.0   RECOMMENDATIONS

The system delivered to Blue Flag at Hurlburt Field meet those requirements specified in the Statement of Work. Additionally, operation of the system was demonstrated to be sufficient to successfully support the BF 92-1 exercise. The system was designed to permit enhancements that will support future war simulation exercises in which Blue Flag at Hurlburt Field is the primary hub of the exercise, and the number of distributed or remote sites is increased to accommodate more participating units. The following paragraphs discuss the considerations involved in making such enhancements. Lessons learned from BF 92-1 are also discussed insofar as they suggest attributes which might be integrated into the system to eliminate problems, reduce cost, or to facilitate operations.

4.1   NETWORK CONFIGURATION

A hub-spoke network is the arrangement normally utilized for a distributed simulation exercise. A potential DWS network arrangement for a hub at Blue Flag and eight remote sites is shown in Figure 4.1-1.

4.1.1   General DWS Network Design Considerations

Typically, each circuit connecting a remote site to the Hurlburt Hub will be a T1 circuit providing the capability to operate at a total bit rate, including framing overhead bits, of 1.544 Megabits per second (Mbits/sec). Such a circuit has been shown to be sufficient to support three general categories of information between the hub and remote sites: VTC, telephone, and computer data.

Although the system can operate at rates much slower than this, constraints are put upon the capabilities of the individual subsystems. Through careful planning and an analysis of the required bandwidth of each subsystem, it is possible to reduce the total bandwidth required and run at fractional T1 rates. Table 4.1-I shows the bandwidth used for BF 92-1 and suggested reduced rates.

Table 4.1-I. DWS Data Rates.

Data Type	BF 92-1	Reduced
LAN Data	256K	128K
VTC Data	384K	256K
FAX	64K	64K
Phones (7)	448K	112K
CAFMS	24K	24K
Overhead	10K	5K
TOTAL	**1186K**	**589K**
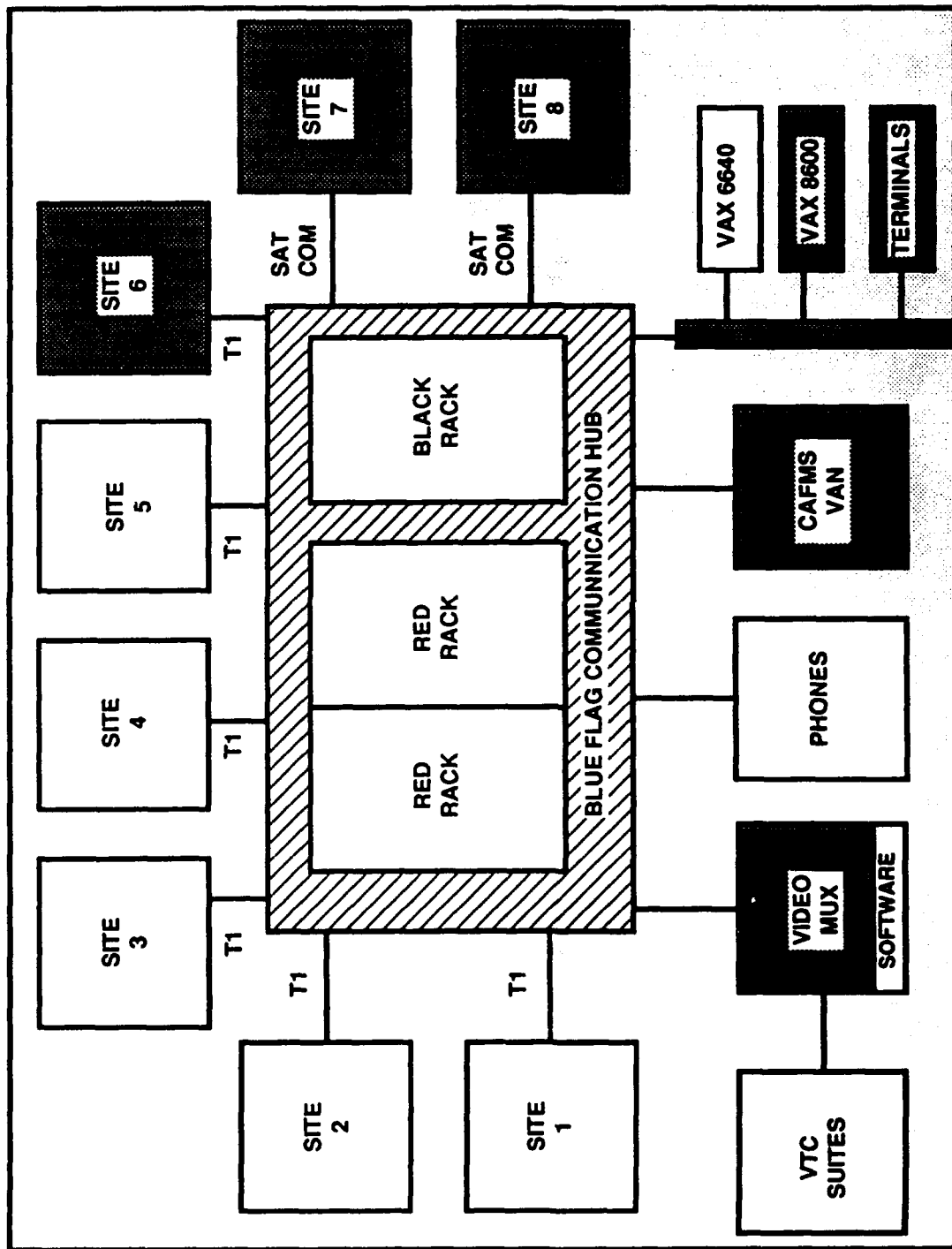
Figure 4.1-1. Blue Flag Hub and Remote Sites Configuration

The system has proven itself to be flexible concerning the speed and configurability to accommodate other external data systems. Several external systems were connected to the DWS system during the course of BF 92-1: the operation of STU-IIIs over the telephone circuits; the connection of the DIVITS imaging system via the STU-IIIs; the connection of the FCC-100 tactical telephone system directly to the communication multiplexer; the connection of the CAFMS system to both the communication multiplexer and to the data network; and the integration of the Barco projection television system and the audio system in the main conference room to the VTC system all verified the adaptability of the DWS hardware to accommodate various interfaces, and systems.

In the following sections, notes concerning operation, problems, and recommendations for future exercises will be presented for each subsystem and geographical facility involved with BF 92-1.

4.2 LONG-HAUL COMMUNICATIONS

Four different types of T1 circuits were used during BF 92-1: AFNET (a new communication network owned and operated by the Air Force); AT&T; a T1 span of the Eglin/Hurlburt T3 fiber optic circuit, and a fiber optic run from Blue Flag to the Army location, six hundred meters east of Building 90005. The overall long-haul network configuration was described in Paragraph 3.5.3.2, and Figure 3.5-4. Use of these carriers proved reliable after the initial setup time. Of the three, the AFNET circuits offer the most future promise. Although initial problems concerning interfacing a clocking arose, the problems were nothing out of the ordinary for a new system. All the problems were quickly identified and corrected. As AFNET nodes are planned for many major Air Force bases around the country, the use of the network may prove to be reliable and cost effective.

4.2.1 Metallic T1 Circuits to the DCO

Three of these T1 circuits terminated at the Hurlburt DCO, located about 3/4 of a mile northwest of the Blue Flag building, Building 90005. The maximum length of a T1 span is approximately 4000 feet, therefore, to get the circuits to the Blue Flag building required the placement of CSUs at the DCO thereby creating a tail-circuit.

4.2.1.1 Physical Considerations

The wire-pairs required to establish these connections have now been verified and established, however, they represent a weak link from the viewpoint of overall system reliability. The use of base standard twisted pair allows for any number of points of interference as the pairs are routed from cable closet to cable closet. Furthermore, as the pairs are a part of a larger group of standard telephone cables run between buildings, they are subject to adjacent pair interference--the result of activity on other wire pairs within the cable. This type of interference is difficult to identify and isolate.

Use of these pairs may be unavoidable with the use of the AFNET network and the Eglin AFB communication circuits as these interfaces to these nodes are fixed at the Hurlburt DCO, however, alternative interfaces to commercial carriers for circuits to other geographical locations should also be examined. An alternate approach would be to determine the feasibility of establishing a couple of direct circuits to a local carrier. By obtaining a point of presence from AT&T or another commercial carrier directly in Building 90005, many of the uncertainties can be removed from overall circuit reliability. Furthermore, responsibility of the circuit as a whole would belong solely to the carrier, as opposed to being distributed between the long-distance carrier, the local carrier, the dial central office, and the plant cabling groups.

4.2.1.2 Circuit Characteristic Considerations

The T1 circuit leased from AT&T used D4 framing. D4 circuits use the AMI (Alternate Mark Inversion) encoding scheme and provide an effective composite data rate of 1.344 Mbits/second at the encryption device. The use of B8ZS (Bipolar 8-Zero Substitution) coding would allow an aggregate payload data rate of 1.536 Mbits/second, normally for the same cost. During Blue Flag 92-1 this option was not available on the commercial circuit. To keep configurations consistent for the first exercise, AMI was used on all three circuits. For future exercises, the use of B8ZS should be investigated.

4.2.2 Direct Fiber Optic Run

The fourth T1 circuit was a direct fiber optic circuit to the Army location. The fiber was run directly from the BLACK Communication Rack in the Computer Room to the SCS in the Army trailer. The circuit was operated at 1.344 Mbits/second. The DWS fiber circuits will support up to 2.1 Mbits/second, however, operation at rates different from other operating circuits are subject to special considerations, described in the following paragraph.

4.2.3 Network Clocking and Synchronization

The Timeplex communication multiplexer combines individual serial data streams for transmission on an aggregate stream over multiple T1 circuits. Upon receiving a stream, the multiplexer separates the individual streams from the aggregate. As a consequence, as with any multiple circuit network, caution must be taken to avoid slip between clocks of the multiple circuits. In the ideal situation the clock on all circuits would be synchronized to the same clock source or clock standard. In actuality, the communication engineer must ensure that the clocks used on a circuit meet the minimal qualifications of a Stratum III clock, or preferably, that of the more accurate Stratum II or I. During planning of Blue Flag 92-1, E-Systems repeatedly stressed the importance that the AT&T, and AFNET, circuits be ordered with implementation of a Stratum I network clock. The plan was to piggy-back the clock from one of these circuits and use the clock for the Army circuit.

Again, as there was with Warrior Flag 90, there was some confusion with the clocking on the AT&T T1 circuit. The circuit was not ordered with a clock. As a backup, a station clock within the DWS equipment (provided as a backup measure) was used to clock the Pt. Loma, Eglin AFB, and Army circuits. (Note: although the Eglin circuit did have a Stratum III clock, E-Systems engineers coordinated with the Eglin tech-controllers the removal of the clock to avoid a third clock within the system). This configuration clocked all the circuits except the AFNET circuit with the same timing standard. The AFNET circuit, which supplied its own clock was compared by E-Systems communication engineers to the station clock, and was determined that the slip between the two clocks was of sufficient accuracy to be non-detrimental to system performance.

The DWS system was designed to be flexible allowing for the implementation of a variety of clocking options since each exercise may use different communication circuits and vendors. During communication engineering for an exercise, the clocking to be provided must be identified and accommodated. Problems developed over these circuits for two basic reasons: (1) lack of communication between of offices requesting service and the office ordering the service; and (2) lack of service-vendor site surveys, until the time the actual installation was to be performed. These items should be addressed on future exercises, to ensure a smooth integration. Additionally, access to a technical point of contact for the commercial circuits prior to the time of the exercise would also help alleviate some of the initial start-up problems.

4.2.4   DSU/CSU Considerations

When providing secure communication over commercial leased lines, care must be taken as to the selection of DSU and CSU units used to connect to the commercial network. The use of encryptors on these circuits virtually assures that "ones density" rules are violated. AT&T Publication 62411, Accunet T1.5 Service, requires specific "ones density" rules which must be followed by network terminating equipment (a maximum of 15 consecutive zeros, and at least "n" ones in every time window of 8 x (n+1) bits, for n=1 to n=23). Cylink DSU/CSUs provide the correct circuit overhead functions that allow the encryptors to be used on these circuits.

Four of the seven Cylink CSUs supplied with the DWS equipment have the capability to accept or provide a clock externally. This method was used to provide the Pt. Loma and Eglin circuits external clocks during Blue Flag 92-1. The capability is achieved through the installation of an external clock module into the CSU units. This feature was provided on these four CSUs as a backup. E-Systems recommends that the remaining CSU units installed at the hub also be equipped with these modules.

As exercises expand and the number of circuits increase, it would be advantageous to have the capability to remotely program and query status from all of the Cylink CSUs (both remote and local). This capability can be achieved through the use of the Cylink Network Management System (CNMS). CNMS is a software program which runs on an IBM PC compilable computer which can

query each unit for operational statistics/status and program each unit. The this system provides the capability to look at error statistics from both the local and remote units. Use of this system can provide a central monitoring and control point for the communication circuits.

4.3   COMMUNICATION MULTIPLEXER CONSIDERATIONS

The current configuration of the Timeplex communication multiplexer consists of a main control frame which houses the link interface and I/O interface cards, and an expansion chassis which houses the telephone interface cards. This configuration is sufficient to support the maximum of eight remote sites, each with one video connection, one data connection, one CAFMS connection, eight telephone circuits and a spare. Expansion of the DWS system to support more than eight sites would require another chassis, configured either as an expansion chassis, or as another control node. The integration of another Timeplex chassis into the DWS system as a control node would not only provide for additional remote sites, but would provide a certain number of hot spare data channels and links should cards fail. Furthermore, a two node network would be less susceptible to multiple clock circuits, since each node could support circuits clocked from common sources.

The Timeplex multiplexers provide a vast amount of network connectivity, configurability, operational status and statistics to the network operator. They are an invaluable tool for network trouble-shooting to isolate problems by providing a number of programmable circuit and channel loopback and pattern tests. All this functionality is available from any terminal connected to the data network thus providing access to any of the multiplexers to the network manager, regardless of where he is. Status and statistics as well as configuration commands must be given to each unit individually. As the number of units expands, individual control will become cumbersome. Timeplex provides a network management system, called TimeVIEW, which offers single point control over the entire network. Additionally, circuits and channel operational status are continuously monitored, and the network manager is alerted via alarms and graphical displays should a problem arise. TimeVIEW is a software product which runs on the Sun Sparc Station platform.

4.4   DATA SUBSYSTEM CONSIDERATIONS

The DWS Data Subsystem connects the ethernet backbone at Blue Flag to the remote sites in a wide area network configuration. This is accomplished with the use of routing bridges at the hub and the remote sites. These bridges accept data packets from their local respective ethernet networks select the packets addressed to nodes outside of the local configuration, and route the packets to the communication multiplexer for transmission.

During Blue Flag 92-1, a minimum of four independent systems were connected to the wide area network provided by the DWS Data Subsystem. These systems include: AWSIMS, CAFMS, Sentinel Byte, and player terminals connected to other computer systems.

4.4.1 Data System Hardware Enhancements

Currently each remote site and the hub each use one Vitalink TransLAN to provide the wide-area network requirements. The remote TransLANs are dual port units whereas the hub TransLAN is an eight port unit (one port providing connectivity to one remote location). As the DWS system was designed to support at most eight remote sites, no spare ports are available on the hub TransLAN should one fail. Furthermore, should failure of a more general nature occur in the hub TransLAN, the data capability to all sites may be lost. The RED Communication Rack of the DWS system was designed with a space immediately below the TransLAN for the placement of a second TransLAN in the future. It is recommended that a second multi-circuit TransLAN be purchased for the DWS system.

Among a large list of functionality, the Vitalink TransLAN bridges perform the error detection and packet retransmission necessary to provide an error free data circuit. As packets are transmitted to and from remote sites, statistics are maintained concerning the number of packets transmitted/received, bytes transmitted/received, CTS/DCD/CRC/Abort errors, queue errors, and a continued list of other operational, and configurable statistics. In the DWS system, this information is accessible from any VT terminal on the network. The information is of a time-duration and history-total nature only. No information concerning peak or sustained transfer rates is available. Furthermore, each TransLAN must be accessed individually to obtain the statistics and determine if a problem exists. The WANmanager, a Vitalink software product, addresses these issues and additionally, allows for a single automated point of control over all of the Vitalink and Digital Equipment Corp products. The WANmanager determines the wide-area network topology automatically and display a graphical representation of the network on the screen using colors to indicate problem status and severity. The WANmanager can run on the VAXstation 2000, VAXstation 3100, DECstation 2100, and DECstation 3100 platforms.

4.4.2 Data Requirements / Computer Operations Analysis

Data network requirements for Blue Flag 92-1 were predictably light since only one AWSIMS workstation, one CAFMS terminals, and up to seven terminals were connected at each site. The data links, running at a data rate of 256 kbits/second, adequately supported this requirement. As future exercises expand, and the number of active workstations and terminals at the remote sites increase, the required data bandwidth will have to be closely watched. The DWS network configuration must be engineered to support the required bandwidth. Estimating the data capacity required to conduct an exercise involves a complex variety of engineering considerations which impact both hardware and software considerations at the system level. As indicated in the following paragraphs, successfully addressing these considerations to optimize and facilitate exercise play requires that the level and intensity of exercise play be estimated or defined before making critical design decisions about the data processing and communication networks.

4.4.2.1   Data Processing Requirements

Identifying the requirements (quantity, type, size, model, etc.) for hardware to perform the data processing and to exchange data with the appropriate terminals at the hub or the remote sites is highly dependent upon such key factors as:

(a)   What number of independent games are to be played at the remote site?

(b)   How many players (i.e. the number of terminals) will be entering data at each site?

(c)   Based upon the above two questions, how many workstations and terminals will be required at each of the sites?

(d)   How will the workstations and terminals be configured?

Other factors such as available floor space, power limitations, air conditioning limitations or security requirements may also place limitations on platforms and equipment to be used during exercises.

The resolution of such hardware factors provides a starting point to look at system software and simulation related issues. To obtain a good measure of the network bandwidth required to support an exercise, the following questions must be resolved:

(a)   What games will be played simultaneously, i.e. the Air Game and the Ground Game?

(b)   How much data and at what frequency will players be entering data at the terminals? What effective data rate does this represent?

(c)   At what time interval will the Air Game updates occur, and what is the maximum and mean size of these updates?

(e)   Based on the system configuration of the workstations and terminals, what will be the overhead bandwidth load used by the operating system to maintain the established circuits and connections? Clustered work stations over a communication circuit can lead to significant data transfer requirements to support the system overhead.

Only after such hardware and software issues have been agreed upon and an accurate estimate of the required bandwidth obtained, can the proper network engineering be performed to help insure the successful operation of an exercise.

Analysis in sufficient detail to properly engineer the DWS system and to ensure that the DWS is adequate to support future expanding requirements is an expensive undertaking in both manpower and resources. It need not, however, be a recurring effort. The characterization and establishment of baseline operational requirements for conducting distributed training exercises should be

established. Its use during the initial planning of future exercises as part of the planning process of such activities would benefit the engineering process. Furthermore, it would provide a baseline for estimating future requirements and would furnish a means of identifying possible inadequacies in support of the such requirements, allowing sufficient lead time to implement corrective action.

4.4.2.2   SATCOM Operations

E-Systems experience during Warrior Flag and at the WPC has shown that the operation of simulation and computer networks over SATCOM circuits differs substantially from operation of the same systems over commercial networks. The inherent delay associated with SATCOM circuits requires system and network tuning to operate in the varied environment. Tuning considerations include: the extension of time-out parameters to allow for increased delay between events; increased buffer memory to allow additional information to be received and transmitted prior to acknowledgement pauses; changes to circuit parameters to provide a less sensitive response to circuit drop-outs, and to allow for circuit re-establishment after more significant circuit drops. Additionally, since LAT is not operable over SATCOM circuits, additional processing will be required to allow each terminal to log on to a DECnet based system operating as a server.

When conducting an exercise involving SATCOM circuits it is imperative that system and networking parameters be examined prior to the exercise period. A list of current operating parameters should be made and each parameter reviewed for applicability during SATCOM operation. It is recommended that the SATCOM circuits become "HOT" a minimum of five days prior to other circuits. During this time, test simulations should be run to further refine the tuned parameters, to develop optimal operation. Since SATCOM circuits are subject to periodic interference, these circuits should always be monitored. Circuit "hit rates", circuit quality and failure statistics should be logged and reviewed for such tendencies.

4.5   VTC OPERATION

The VTC Multiplexer system at Blue Flag supports up to nine simultaneous video transmissions in a 3x3 format, or up to four transmissions in a 2x2 format. Only seven video transmissions may be transmitted to remote sites. This limitation arises from the number of codecs which form a part of the VTC Multiplexer system. Each remote transmission requires one of the seven codecs within the system. Since the DWS system supports up to eight remote sites, it is recommended that an additional codec be purchased to provide video capabilities to the eighth site.

4.5.1   Hub Video Suite Interconnection

Currently, the two local hub suites are connected to the VTC Multiplexer via fiber optic links and codec connections, i.e. codec to codec. Two of the seven available codecs are therefore used to support the local suites, thus reducing the number of external video transmissions to five. This situation can be avoided by connecting

the local suites directly to the VTC multiplexer. To do so however, would require additional video and audio cables to connect the video and audio signals to the VTC Multiplexer system. The distance from the VTC Multiplexer to the main conference room would require a video and audio amplifier. A preferred alternative would be the purchase of fiber optic video modems. The modems, capable of transmitting video, audio, and data over fiber would be used to transfer the signals directly to the VTC Multiplexer system. These configurations would eliminate the need of multiple cables and would release the two codecs currently used to connect the hub suites, and allow their use for additional remote systems should they be purchased.

4.5.2   Conference Room / DWS Integration

During Blue Flag 92-1 a significant amount of effort was used to integrate, on a temporary basis, the DWS with the Barco projection television and the audio system, both within the main conference room. Although such efforts were moderately successful, quality, reliability, and flexibility can all be improved with some engineering and planning for the permanent integration of these systems. The use of an audio switching board to accept and mix different inputs from microphones within the conference room would increase the audibility and improve overall control of microphones within the conference room.

4.5.3   Video/Audio Monitors

The use of video/audio monitors during Blue Flag 92-1 did not prove to be successful due to the distances involved between the placement of the monitors and the VTC Multiplexer system. The use of video and audio amplifiers placed at the VTC Multiplexer or in-line with the monitors would allow the use of such monitors and would provide maximum control of the monitors from the VTC Control computer. Hum stop filters may also be required when running video signals great distances.

4.5.4   Graphics Imaging

The graphics capability of the DWS system was seldom used during Blue Flag 92-1. Two main reasons were identified to explain this: (1) inadequate training related to the capability, and (2) difficulty of use due to the layout of the main conference room. The graphics capability transfers image data from a graphics or auxiliary camera with a greater resolution than standard video. Graphics images transferred by this means appear sharper and clearer on the receiving end than normal images. Further more, the image is frozen on the second display monitor, while motion can continue on the main monitor. With practice, a much more impressive and informative presentation results from the simultaneous use of both cameras.

To utilize the graphics capability, the graphics must be viewed prior to transmission. This was not possible during BF 92-1 since the document camera was positioned to the side of the monitors. Placement of the document camera into the projection room, and the use of a secondary monitor to observe the image

to transfer, would resolve these shortcomings and provide the opportunity of more dynamic presentations.

Transferring a graphics image from the hub to remote sites is a two-step process. The image must first be transferred to the codec located within the VTC multiplexer, and then the image is transferred by the VTC operator to the remote sites. The development of a remote graphics command switch would eliminate the VTC control requirement and allow the presenter in the conference room to transmit the graphic to the remote sites.

4.5.5   PC Presentations

During the BF 92-1 Hot Wash, the Pt. Loma presentation used a PC and graphics slides developed on the PC via a graphics presentation program. A picture of the monitor was transmitted to all sites with good results. The purchase of a VGA-to-NTSC card for a PC would allow a direct connection of the PC to the video system, producing a clearer, more detailed picture.

4.5.6   Interfacing to Other VTC Systems

4.5.6.1   JWC VTC Interoperability

The JWC VTC system was connected to the DWS VTC system and successfully transmitted video images to each other. The use of a PictureTel codec on the JWC system acting as a bridge was required. A non-mating connector prevented an audio connection, however, the audio circuits are electrically compatible.

4.5.6.2   Multi-Vendor Interoperability

Recent adaptation of the CCITT Video Teleconferencing Systems Standard Px64 now provide interoperability between VTC systems of different vendors. The three largest vendors, CLI, Video Telecom, and the DWS vendor PictureTel all offer software complying with the Px64 specification. The use of this software should be investigated.

4.6   TELEPHONE USAGE

Telephone communication encompasses voice, facsimile, and external low data rate systems since all these functions are processed by the PABX at the hub. The DWS system nominally provides eight telephone circuits to each remote site and thirty-two telephone circuits to the hub. On of the circuits at each of the remote sites was used for a facsimile machine. On or more facsimile machines may be connected at the hub.

Of the thirty-two telephone circuits distributed at the hub, three were used within the Computer Room: one for "Comm Control", one for "VTC Control" and one for an E-Systems facsimile machine. One additional telephone could have been used for the computer operators. The remaining twenty-eight telephone circuits were distributed throughout the Blue Flag facility.

For exercises with the size and scope of Blue Flag 92-1, the availability of telephone circuits was sufficient to meet the incurred demand. However, the amount of active play at the remote sites was limited to only a few terminals. External systems using the telephone circuits were limited to only one STU-III and one DIVITS terminal at each of the sites, except Pt. Loma. Should future exercises require a larger active number of persons at remote sites, or a larger number of external systems using the telephone circuits, the number of circuits at each of these sites must increase to provide the additional support demanded of the larger group. Such an expansion would require the expansion of the supplied PABX. The PABX is hub is expandable by adding another shelf to the two shelf unit currently in use. Additionally, the statistical capabilities could be used during exercises to obtain data concerning telephone usage.

4.7   MISCELLANEOUS DWS CONSIDERATIONS

Many problems associated with the initial setup at remote locations and at the hub can be traced to inadequate follow-up of communication and logistics issues. A generalized list of items to be performed on site surveys should be developed. Such a list would ensure the proper information is obtained from all sites prior to the exercise and would highlight any deficiencies at a particular location. Such a list might include the following items:

(a)   POC for general coordinator of all advance work to be performed (including phone numbers).

(b)   POC for shipping and receiving and agreement as to temporary storage location for DWS equipment.

(c)   POC for local communications. Agreement on required date, and on testing of the local circuits. List of contractors or comm squadron responsible for performing this service.

(d)   Agreement to have a DSN phone operational near the final location of the DWS equipment.

4.7.1   Remote Site Considerations

A successful communication circuit is highly dependant upon connectivity between the point-of-presence of the long-haul communications supplier and the location of the DWS secure communication suite. These two locations are often in different buildings on a base. The method by which these two locations will be connected and the orders required to implement these connections should be agreed upon during the site survey. The DSU/CSU units can be removed from the remote kits and delivered to the comm squadron or contractor responsible for the inter-building cabling for operational testing of the circuit prior to the arrival of the tech controllers from Blue Flag.

Experience has proven that locating and testing of such circuits is difficult at best. The purchase of the equipment listed in the following section, to be used at the remote installation locations would provide for much quicker installations.

The addition of a DEMPR in the terminal case would add the flexibility of locating workstations a further distance from the SCS communications equipment.

Several problems arose concerning the operation of print queues connected to printers off of the remote terminal servers. This operation should be further investigated and tested locally at Blue Flag using the remote kits.

The inclusion of additional power strips in each kit would provide greater flexibility in placement of equipment.

4.7.2   Test Configurations and Test Equipment

Integration and communication issues during Blue Flag 92-1 have highlighted the need for additional test equipment at the remote sites. The recommended test equipment is listed below:

> Tone generator,
> Inductive line receiver,
> Butt set,
> T-Bird Portable T1 circuit test equipment,
> Wire crimpers for building and repair of cables.

The recommended additional equipment for use at the hub is listed below:

> Another TIMS for performing loopback tests on phone circuits (one set was supplied).
> A T1 Interface card for the supplied BERT to aid in the integration of the long-haul communication circuits.
> Wire crimpers for building and repair of cables.
> A "Hands Free" telephone for network control.
> An additional commercial telephone on the network control table.

4.7.3   Personnel Training

Although E-Systems personnel provided training to available personnel at both the hub and remote sites during Blue Flag 92-1, the availability of persons to be trained was minimal. To obtain adequate training the same persons must be available continually (at a minimum), during the installation, integration and operation of the DWS equipment. Availability on an hour-to-hour basis, as was the case at the hub during Blue Flag 92-1, is ineffective. Although personnel from the 727th TCG at the remote locations received more extensive training, the completeness of the training is still only marginally effective. This is because operation and hands on experience is limited by the requirement that all equipment remain "operational" during an exercise. This prevents actual experience of some of the most important configuration activities.

Experience has shown that the most efficient and longest retained training is obtained in a lab-like hands-on atmosphere where personnel may actually make changes to the communications equipment and observe the effects of those changes on the actual equipment. This environment can be obtained by installing the remote kits at Blue Flag, at a time other than during an exercise, and bringing up the equipment as a remote site connected to the hub DWS equipment. The purchase of a documentation kit and training materials would further enhance this effort.

4.7.4   Site Manning

We recommend, at a minimum, one tech controller and one computer operator be TDY at each site. Cross training of these personnel so each has an understanding of the names and functions of each piece of equipment in the opposing specialty, would allow each person to be talked through basic maintenance functions by persons at the hub. This would allow personnel to work staggered shifts during operations.

4.7.5   Spares Recommendations

The DWS communications equipment installed at the hub will support up to eight remote sites. Only five remote site kits were purchased. No spares were obtained. The failure of one critical piece of equipment can render an entire remote site non-operational. E-Systems recommends the purchase of spares for the critical items.

4.7.6   Concept of Maintenance

E-Systems recommends the development of DWS Operations and Maintenance Manuals.

The operations manual should contain information necessary to install and operate a remote site. This document should be updated for each exercise and have a site specific section containing data obtained during or after the site survey pertinent to the site, such as the long-haul comm integration plan and a list of the POCs. Items contained in such a document might include: kit parts lists; arrival checklists; installation checklists; equipment configurations and parameter lists used during the setup and operation of an exercise; configuration, setup and operational procedures; subsystem configurations; equipment strappings; cabling diagrams; reference sheets; site specific information and emergency contact phone numbers.

The maintenance manual should be used to maintain and track the operation and failures of the DWS equipment. It is envisioned that this manual would contain a serialized list of equipment by kit serial number, and a list of vendors and support and repair phone numbers. In addition, a log of failures and a log of shipments of the equipment should be maintained.

5.0 CONCLUSIONS AND SUMMARY

During exercise Blue Flag 92-1 the operation of the DWS equipment, supplied and integrated by E-Systems at Hurlburt Field, was verified. Furthermore, the use of the DWS system as a communications conduit for real-world systems such as STU-IIIs and the FCC-100 tactical phone system was also demonstrated with few difficulties identified. Careful attention to problems identified at each exercise and at each location combined with the application of these lessons to future exercises will ensure success of future exercises.

E-Systems has demonstrated the talent base and the dedication of its personnel that is necessary to provide the level of support required for a successful operation. E-Systems is in a unique position to assist Blue Flag with additional support for: the expansion of the hub to more than eight sites; the development of additional remote site kits; the integration of DWS with other communications networks; or the software development of models to operate in a distributed environment.

APPENDIX A

HUB SCHEMATIC

Cabling Diagram
BLUE FLAG HUB
BLACK RACK
Page 1 of 4

E-SYSTEMS

AJP   12/8/91

NOTE:
TIMEPLEX
CONNECTIVITY
CONTINUED ON PAGE 3

F/O CABLE

W-152

J1
J2   FO
J3
J4   MUX
J5
J6   (CAFMS)
J7
J8

W-494   401-43930-11
W-494   401-43930-12
W-494   401-43930-13
W-494   401-43930-14
W-494   401-43930-15
W-494   401-43930-16
W-494   401-43930-17
W-494   401-43930-18

CMUX

15A
15B
15C
15D
16A
16B
16C
16D

11A
11B
11C
11D
12A
12B
12C
12D

3A
3B
4A
4B
5A
5B
6A
6B
7A
7B
8A
8B
9A
9B
10A
10B

1B

W-495 401-43930-21
W-495   22
W-495   23
W-495   24
W-495   25
W-495   26
W-495   27
W-495   28

TRANSLAN
J-ENET CONSOLE
[8] [7] [6] [5] [4] [3] [2] [1]

W-954
401-43930-82

W-496   401-43930-71

DELNI
J3   J1

W-359
401-43930-92

②

FROM
W-360 PBX
401-43930-93

W-488

J-AUI
J2 J3

TERMINAL SERVER
J1

401-43930-70

W-358
401-43930-91

W-953
401-43930-81

RED PATCH PANEL

POS1-J1
POS2-J1
POS3-J1
POS4-J1
POS5-J1
POS6-J1
POS9-J1
POS10-J1

W-493   401-43930-01   POS1-J2
W-493   401-43930-02   POS2-J2
W-493   401-43930-03   POS3-J2
W-493   401-43930-04   POS4-J2
W-493   401-43930-05   POS5-J2
W-493   401-43930-06   POS6-J2
W-493   401-43930-07   POS9-J2
W-493   401-43930-08   POS10-J2

NOTE: ALL DASH
NUMBERS ON THIS
PAGE ARE
"401-43930XX"
UNLESS OTHERWISE
SPECIFIED.

①

A-2

Cabling Diagram
BLUE FLAG HUB
RED RACK

E-SYSTEMS

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A-3

Cabling Diagram
BLUE FLAG HUB
CLOCK SWITCH DETAIL

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E-SYSTEMS

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A-4

PANEL 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
100	101	102	103	104	130	140	150	200	201	202	203	204	230	240	250	300	301	302	303	304	330	340	350	

26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
400	401	402	403	404	430	440	450	500	501	502	503	504	530	540	550	600	601	602	603	604	630	640	650	

PANEL 2

1	2	3	4	5
940	941	950	951	

PANEL 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	

26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
924	925	930	931	700	701	702	703	704	730	740	750	800	801	802	803	804	830	840	850					

KEY:

PANEL POSITION NUMBER → 4

PHONE NUMBER → 103

PANEL NUMBER → PANEL 1

E-SYSTEMS

MAIN PHONE PATCH PANEL

AJP 12/10/91

PANEL 1 | PANEL 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1/2	3/4	5/6	7/8	9/10	11/12	13/14	15/16	17/18	19/20	21/22	23/24	25/26	27/28	29/30										

26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1/2	3/4	5/6	7/8	9/10	11/12	13/14	15/16	17/18	19/20	21/22	23/24	25/26	27/28	29/30										

KEY:

M-BLK NUMBER → 2

PANEL POSITION NUMBER → 32

66 BLOCK CLIP NUMBER T/R → 13/14

e.g., BLOCK NUMBER 2, TIP IS CLIP 13 RING IS CLIP 14

A-6

E-SYSTEMS
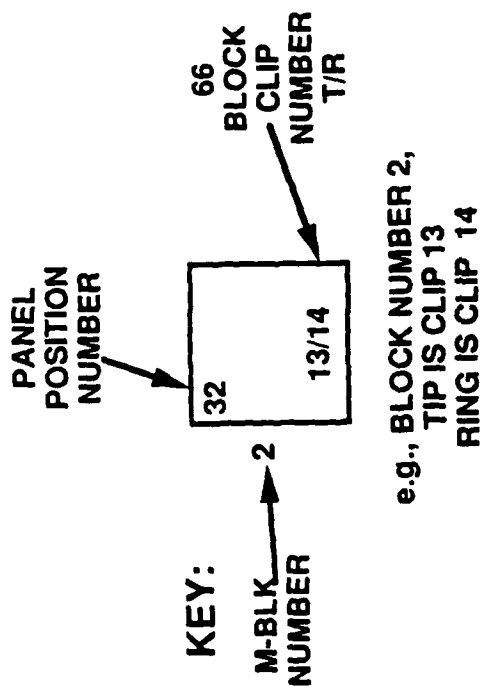
LOCAL PHONE PATCH PANEL

AJP

12/10/91

APPENDIX B

SCS SCHEMATIC

POWER SUPPLY

401-43932-48
W-418

CRYPTO MOUNT (HNF)

KG-94 A-1 RED

KG-94 A-2 RED

W-404 401-43932-34 LINE 1

W-404 401-43932-35 LINE 2

TO MUX CASE RED INTERFACE PANEL

BLK A-1

BLK A-2

CLOCK SWITCH (See Detail Page 4)

W-402 401-43932-32

W-403 401-43932-33

BLACK P/P (BPP)

P1: J2 P1: J1

P2: J2 P2: J1

W-401 401-43932-30

W-402 401-43932-31

CSU/DSU (CDSU)

DTE

NETWORK

RS232C

W-417 401-43932-21

W-503 401-43932-90

401-43932-01 W-202 MAINT TERM

FO MODEM (FOM) J-R8440

T

R

FO

W-101

W-102

ST TX

ST RX

TO SATCOM

BLACK INTERFACE PANEL

RJ 45 J1

RJ 45 J3

TO COMM LINE

W-416 401-43932-50

T B P

SATCOM VAN

FOM W-3ST 401-43903-50

B-1

Cabling Diagram
SECURE COMM SET
MULTIPLEXOR CASE

Page 2 of 4

E-SYSTEMS

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E-SYSTEMS

Cabling Diagram
SECURE COMM SET
TERMINAL CASE

Page 3 of 4

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PLAYER TERMINALS (10)

W-308 401-43932-99
W-308 401-43932-99
W-308 401-43932-99
W-308 401-43932-99
W-308 401-43932-99

W-308 401-43932-99
W-308 401-43932-99
W-308 401-43932-99
W-308 401-43932-99
W-308 401-43932-99

MAINTENANCE
TERMINAL
(MTRM)

RS 232

TERMINAL SERVER
(TSRV)

J6
J7
J8
J9
J10

J1 J2 J3 J4 J5 J16 J15 J14

W-906
401-43932-93

W-307
401-43932-06

W-305 401-43932-04
CMUX MAINT (RIP)
W-306 401-43932-05
TLAN MAINT (RIP)

W-413
401-43932-71

TO MUX CASE (RIP)

TO PLAYER
WORK STATIONS
(5)

W-414 401-43932-72
W-414 401-43932-72
W-414 401-43932-72
W-414 401-43932-72
W-414 401-43932-72
W-414 401-43932-72
W-414 401-43932-72
W-414 401-43932-72

DELNI

J8
J7
J6
J5
J4
J3
J2
J1

B-3

CLOCK SWITCH PIN-OUTS

SWITCH DOWN
KEY DOWN

SWITCH UP
KEY DOWN

(1) DETAIL SHOWN ONCE.
REPEAT FOR EACH CHANNEL.

E-SYSTEMS
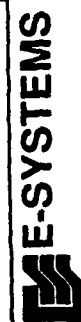
Cabling Diagram
SECURE COMM SET
CLOCK SWITCH
DETAIL
Page 4 of 4

AJP

12/30/91

TB1

RCTC
RCTC/
SHIELD

1
2
3
4
5
6
7
8
9
10
11
12

SD/A
SD.B
RD/A
RD/B
RT/A
RT/B
TT/A
TT/B

401-43932-33

JUMPERS

TB4

BSC
BSC/
SHIELD

1
2
3
4
5
6
7
8
9
10
11
12

BLU
WHT
CLR

JUMPERS

CLOCK SWITCH

ST/A
ST/B
SHIELD

13
14
15

1. SWITCH SHOWN IN NORMAL ("NETWORK" - DOWN) POSITION.

DRAWINGS/CD/SCC (PREFIX)/SCC4

APPENDIX C

HUB INVENTORY

Blue Flag Hub Inventory List

	BLACK RACK		
DESCRIPTION	**PART #**	**QTY**	**HUB**
FO MODEM	SATCOM	1	2914
FO MODEM	SATCOM	1	2923
FO CABLE, FOM-BIP	1 METER	2	X
STATION CLOCK	1295	1	11914Y
CABLE, CLK-HNF	401-43929-70	1	X
CABLE, CLK-HNF	401-43929-71	1	X
CABLE, CLK-HNF	401-43929-72	1	X
CABLE, CLK-HNF	401-43929-73	1	X
CABLE, CLK-HNF	401-43929-74	1	X
CABLE, CLK-HNF	401-43929-75	1	X
CABLE, CLK-HNF	401-43929-76	1	X
CABLE, CLK-HNF	401-43929-77	1	X
PANEL, CLOCK SWITCH	401-43919	1	X
CABLE, FOM-BPP	401-43929-37	1	X
CABLE, FOM-BPP	401-43929-38	1	X
CDSU	MODEL 4202	1	13348
CDSU	MODEL 4202	1	13343
CDSU	MODEL 4202	1	13358
CDSU	MODEL 4202	1	13829
CDSU	MODEL 4202	1	13827
CDSU	MODEL 4202	1	13830
CDSU	EXT CLK MODULE	1	392
CDSU	EXT CLK MODULE	1	395
CDSU	EXT CLK MODULE	1	391
CDSU	EXT CLK MODULE	1	400
CABLE, CDSU-BPP	401-43929-30	1	X
CABLE, CDSU-BPP	401-43929-31	1	X
CABLE, CDSU-BPP	401-43929-32	1	X
CABLE, CDSU-BPP	401-43929-33	1	X
CABLE, CDSU-BPP	401-43929-34	1	X
CABLE, CDSU-BPP	401-43929-35	1	X
CABLE, CDSU-BPP	401-43929-36	1	X
CABLE, CDSU-BIP, MAINT	401-43929-91	1	X
CABLE, CDSU-BIP, MAINT	401-43929-92	1	X
CABLE, CDSU-BIP, MAINT	401-43929-93	1	X
CABLE, CDSU-BIP, MAINT	401-43929-94	1	X
CABLE, CDSU-BIP, MAINT	401-43929-95	1	X
CABLE, CDSU-BIP, MAINT	401-43929-96	1	X
CABLE, CDSU-BIP, MAINT	401-43929-97	1	X

Blue Flag Hub Inventory List

PANEL, MAINT BLACK	401-43927	1	X
CRYPTO MOUNT	HNF-81	1	3658
CRYPTO MOUNT	HNF-81	1	3659
CRYPTO MOUNT	HNF-81	1	3660
CRYPTO MOUNT	HNF-81	1	3661
CABLE, HNF-BPP	401-43929-40	1	X
CABLE, HNF-BPP	401-43929-41	1	X
CABLE, HNF-BPP	401-43929-42	1	X
CABLE, HNF-BPP	401-43929-43	1	X
CABLE, HNF-BPP	401-43929-44	1	X
CABLE, HNF-BPP	401-43929-45	1	X
CABLE, HNF-BPP	401-43929-46	1	X
CABLE, HNF-BPP	401-43929-47	1	X
CABLE, HNF-RPP	401-43929-50	1	X
CABLE, HNF-RPP	401-43929-51	1	X
CABLE, HNF-RPP	401-43929-52	1	X
CABLE, HNF-RPP	401-43929-53	1	X
CABLE, HNF-RPP	401-43929-54	1	X
CABLE, HNF-RPP	401-43929-55	1	X
CABLE, HNF-RPP	401-43929-56	1	X
CABLE, HNF-RPP	401-43929-57	1	X
CABLE, HNF-SWITCH	401-43929-60	1	X
CABLE, HNF-SWITCH	401-43929-61	1	X
CABLE, HNF-SWITCH	401-43929-62	1	X
CABLE, HNF-SWITCH	401-43929-63	1	X
CABLE, HNF-SWITCH	401-43929-64	1	X
CABLE, HNF-SWITCH	401-43929-65	1	X
CABLE, HNF-SWITCH	401-43929-66	1	X
CABLE, HNF-SWITCH	401-43929-67	1	X
BLACK PATCH PANEL	RS-422	1	X
POWER SUPPLY	28V	1	450468
POWER SUPPLY	28V	1	453860
POWER SUPPLY	28V	1	453892
POWER SUPPLY	28V	1	450644
POWER SUPPLY	28V	1	453950
POWER FILTER	401-36408-01	1	105
POWER CABLE, HNF-P.S., DC	401-43929-80	1	X
POWER CABLE, HNF-P.S., DC	401-43929-81	1	X
POWER CABLE, HNF-P.S., DC	401-43929-82	1	X
POWER CABLE, HNF-P.S., DC	401-43929-83	1	X

Blue Flag Hub Inventory List

EQUIPMENT RACK	77 INCH	1	91EO1
NAMEPLATE	401-43908-01	1	91EO1
	RED RACK (MUX)		
DESCRIPTION	**PART #**	**QTY**	**HUB**
FO MUX	306	1	553
CABLE, FOMUX-CMUX	401-43930-11	1	X
CABLE, FOMUX-CMUX	401-43930-12	1	X
CABLE, FOMUX-CMUX	401-43930-13	1	X
CABLE, FOMUX-CMUX	401-43930-14	1	X
CABLE, FOMUX-CMUX	401-43930-15	1	X
CABLE, FOMUX-CMUX	401-43930-16	1	X
CABLE, FOMUX-CMUX	401-43930-17	1	X
CABLE, FOMUX-CMUX	401-43930-18	1	X
MULTIPLEXER	CONTROL	1	C2016551
MULTIPLEXER	EXPANSION	1	C2016552
NETWORK MODULE	NCL	1	2144377
NETWORK MODULE	NCL	1	2144467
INTERLINK MODULE	ILC.2	1	69968
INTERLINK MODULE	ILC.2	1	73204
INTERLINK MODULE	ILC.2	1	66248
INTERLINK MODULE	ILC.2	1	66730
INTERLINK MODULE	ILC.2	1	67665
INTERLINK MODULE	ILC.2	1	64343
INTERLINK MODULE, BFR	ILC.2S	1	63804
INTERLINK MODULE, SAT BFR	ILC.2S	1	67550
BYPASS MODULE	BPM	1	2140275
ENHANCED VOICE MODULE	FXO	1	1028919
ENHANCED VOICE MODULE	FXO	1	1028920
ENHANCED VOICE MODULE	FXO	1	1038388
ENHANCED VOICE MODULE	FXO	1	1028938
ENHANCED VOICE MODULE	FXO	1	1028928
ENHANCED VOICE MODULE	FXO	1	1021055
ENHANCED VOICE MODULE	FXO	1	1038381
ENHANCED VOICE MODULE	FXO	1	1038382
ENHANCED VOICE MODULE	FXO	1	1038378
ENHANCED VOICE MODULE	FXO	1	1021032
ENHANCED VOICE MODULE	FXO	1	1038377
ENHANCED VOICE MODULE	FXO	1	1038400
ENHANCED VOICE MODULE	FXO	1	1038380
ENHANCED VOICE MODULE	FXO	1	1038384
ENHANCED VOICE MODULE	FXO	1	1011605
ENHANCED VOICE MODULE	FXO	1	1011609
ADAPTOR, CMUX-PHONE	NTM	1	S030508
ADAPTOR, CMUX-PHONE	NTM	1	S030530
ADAPTOR, CMUX-PHONE	NTM	1	S030501
ADAPTOR, CMUX-PHONE	NTM	1	S1030690
ADAPTOR, CMUX-PHONE	NTM	1	S1030687

C-3

Blue Flag Hub Inventory List

ADAPTOR, CMUX-PHONE	NTM	1	S1030683
ADAPTOR, CMUX-PHONE	NTM	1	S1030721
ADAPTOR, CMUX-PHONE	NTM	1	S1030726
ADAPTOR, CMUX-PHONE	NTM	1	S1030725
ADAPTOR, CMUX-PHONE	NTM	1	S1030688
ADAPTOR, CMUX-PHONE	NTM	1	S1030746
ADAPTOR, CMUX-PHONE	NTM	1	S1030685
ADAPTOR, CMUX-PHONE	NTM	1	S030509
ADAPTOR, CMUX-PHONE	NTM	1	S1030722
ADAPTOR, CMUX-PHONE	NTM	1	S1O30724
ADAPTOR, CMUX-PHONE	NTM	1	S1030725
QUAD SYNC MODULE, RS-232	QSP	1	2105100
QUAD SYNC MODULE, RS-232	QSP	1	2104104
QUAD SYNC MODULE, RS-422	QSP.2	1	2146307
QUAD SYNC MODULE, RS-422	QSP.2	1	2146299
QUAD SYNC MODULE, RS-422	QSP.2	1	2146310
QUAD SYNC MODULE, RS-422	QSP.2	1	2146301
MUX FAN ASSY	FAN	1	C2016603
POWER SUPPLY	PS/L1	1	C09WF06502
POWER SUPPLY	PS/L1	1	C09WF06433
POWER SUPPLY	PS/L1	1	C09WF06496
DRIVER MODULE	DRC2	1	2141584
DRIVER MODULE	DRE2	1	2141678
ADAPTOR, CMUX	401-43930-81	1	X
CABLE, CMUX-TSRV, MAINT	401-43930-91	1	X
CABLE, CMUX-RPP	401-43930-01	1	X
CABLE, CMUX-RPP	401-43930-02	1	X
CABLE, CMUX-RPP	401-43930-03	1	X
CABLE, CMUX-RPP	401-43930-04	1	X
CABLE, CMUX-RPP	401-43930-05	1	X
CABLE, CMUX-RPP	401-43930-06	1	X
CABLE, CMUX-RPP	401-43930-07	1	X
CABLE, CMUX-RPP	401-43930-08	1	X
CABLE, CMUX-VTC	401-43930-XX	7	GFE
FO MODEM, VTC	VTC	1	2913
FO MODEM, VTC	VTC	1	2918
FO CABLE, FOM-VTC PANEL	1 METER	2	X
RED PATCH PANEL	RS-422	1	X
BERT	6000	1	14127
PANEL, RED MAINT	401-43927-01	1	X
CABLE, FOM-CODEC	401-43930-50, 25'	1	X
CABLE, FOM-CODEC	401-43930-50, 10'	2	X

Blue Flag Hub Inventory List

DESCRIPTION	PART #	QTY	HUB
CABLE, FOM-CODEC	401-43930-50, 5'	1	X
EQUIPMENT RACK	77 INCH	1	91EO1A
NAMEPLATE	401-43907-01	1	91EO1A
	RED RACK (PBX)		
DESCRIPTION	**PART #**	**QTY**	**HUB**
PBX	CHASSIS, #1	1	OO10915714
PBX	CHASSIS, #2	1	OO10915715
ADAPTOR, PBX	401-43930-80	1	X
CABLE, PBX-TSVR	401-43930-93	1	X
CABLE, PBX-PATCH	401-43930-62	1	X
CABLE, PBX-PATCH	401-43930-63	1	X
CABLE, PBX-PATCH	401-43930-64	1	X
CABLE, PBX-PATCH	401-43930-65	1	X
CABLE, PBX-PATCH	401-43930-66	1	X
MAIN PHONE PATCH	50 PATCH	2	X
MAIN PHONE PATCH	25 PATCH	1	X
CABLE, CMUX-MAIN, SILVER	VTC-12763-06-S	16	X
CABLE, CMUX-MAIN, RED	VTC-12763-06-S-R	16	X
CABLE, CMUX-MAIN, GREEN	VTC-12763-06-S-GR	16	X
CABLE, CMUX-MAIN, BLACK	VTC-12763-06-S-B	16	X
LOCAL PHONE PATCH	50 PATCH	1	X
CABLE, PATCH-BLOCK	VTC-025-PC-004	2	X
CABLE, MAIN-LOCAL, BLUE	VTC-12763-02-S-BL	14	X
CABLE, MAIN-LOCAL, BLUE	VTC-12763-01-S-BL	14	X
CABLE, MAIN-LOCAL, GOLD	VTC-12763-02-S-G	14	X
CABLE, MAIN-LOCAL, GOLD	VTC-12763-01-S-G	14	X
OSCILLOSCOPE	DUAL TRACE	1	DM540001
TRANSLAN	350	1	7C00525E
ADAPTOR, TLAN	401-43930-82	1	X
CABLE, TLAN-TSRV-MAINT	401-43930-92	1	X
CABLE, TLAN-CMUX	401-43930-21	1	X
CABLE, TLAN-CMUX	401-43930-22	1	X
CABLE, TLAN-CMUX	401-43930-23	1	X
CABLE, TLAN-CMUX	401-43930-24	1	X
CABLE, TLAN-CMUX	401-43930-25	1	X
CABLE, TLAN-CMUX	401-43930-26	1	X
CABLE, TLAN-CMUX	401-43930-27	1	X
CABLE, TLAN-CMUX	401-43930-28	1	X

Blue Flag Hub Inventory List

LAN INTERCONNECT	DELNI	1	33898
CABLE, DELNI-TLAN	401-43930-70	1	X
CABLE, DELNI-TSRV	401-43930-71	1	X
TERMINAL SERVER	8 PORT	1	DF002473
FO MUX, RS-232	306	1	X
EQUIPMENT RACK	ICSFR127A	1	91EO1B
NAME PLATE	401-43907-01	1	X
	MISCELLANEOUS EQUIPMENT		
DESCRIPTION	**PART #**	**QTY**	**HUB**
VTC MUX SYSTEM	401-43910-01	1	GFE
NAMEPLATE, VTC MUX	401-43909-01	1	X
IBM/PC	386	1	X
RS-232 SWITCHER	PLUS8-8	1	X
VTC SUITE, HUB	401-43905-01	2	X
VTC SUITE, HUB	401-43905-01	2	X
25" DUAL MONITOR	401-43905-01	2	X
REMOTE PTZ CAMERA	401-43905-01	2	X
VIDEO PRINTER	401-43905-01	2	X
NAMEPLATE, VTC SUITE	401-43912-01	2	X
KEYPAD CONTROL		2	X
CABLE, VTC-AUX CAMERA		2	X
DOCUMENT CAMERA	5000-1656	1	X
CABLE, FOM-CODEC	401-43929-	2	X
SG3 SOFTWARE UPGRADE	SG3-2	7	X
TELEPHONE	DTMF	30	X
PHONE CABLE, RJ-11, 5 FT	VTC-12762-05-S	30	X
FACSIMILE	GROUP 3	1	360110630
FACSIMILE	GROUP 3	1	361030382
FO MODEM, VTC	219	1	2921
FO MODEM, VTC	219	1	2919
FO MODEM, SATCOM	219	1	2922
FO MODEM, SATCOM	219	1	2912
FO MODEM, SATCOM	219	1	2922
TERMINAL	VT420	1	TA13472162
TERMINAL	VT420	1	TA13371984
KEYBOARD	30-32041-01	1	HJ141G5535

Blue Flag Hub Inventory List

KEYBOARD	30-32041-01	1	HJ141G5587
SERIAL PRINTER	LA75	1	TY127M007O
PRINTER STAND	FOR LA75	1	X
ETHERNET CABLE	5 METER	1	X
ETHERNET TRANSCEIVER	H4005	1	X
TRANSCEIVER INSTALL KIT	12-24664-02	1	X
CABLE, FOM-SATCOM	401-43929-	7	X
FO CABLE	1000M	2	X
FO CABLE	500M	2	X
FO CABLE	250M	2	X
FO CABLE	100M	2	X
FO CABLE	20M	2	X
FO CABLE	.5M, ST-SMA	3	X
	TEST EQUIPMENT		
DESCRIPTION	PART #	QTY	HUB
TIMS	HAND HELD	1	X
FO SOURCE	HAND HELD	1	X
FO METER	HAND HELD	1	X
FO CABLE	1 METER	1	X
MULTIMETER	HAND HELD	1	X
TOOL KIT	ELECTRONIC	1	X
CRIMPER, MOD. PLUG	TOOL	1	X
4 POSITION DIE SET	RJ11	1	X
8 POSITION DIE SET	RJ45	1	X
6 POSITION DIE SET	MMJ	1	X
LOOP CONNECTOR	CSU	2	X
LOOP CONNECTOR	RED PATCH	1	X
LOOP CONNECTOR	BLACK PATCH	1	X
CONNECTOR, ST-ST	FIBER OPTIC	2	X
CABLE, TEST, RJ45	CROSSOVER	2	X
PATCH CORD	2 FT	4	X
PATCH CORD	3 FT	2	X
PATCH CORD	10 FT	1	X
CABLE, BERT-CMUX	RS-232	1	X
CABLE, BERT-CMUX	RS-422	1	X
CABLE, BERT-PATCH	RS-422 TO PATCH	2	X

Blue Flag Hub Inventory List

INSTALLATION KIT			
DESCRIPTION	PART #	QTY	HUB
VTC PAPER	ROLL	6	X
FAX PAPER	ROLL	2	X
CONNECTOR, MMJ	MMJ	15	X
CONNECTOR, RJ-45	RJ45	15	X
CABLE, 8-WIRE, 1000FT	8-WIRE	1	X
CONNECTOR, RJ-11	RJ11	100	X
CABLE, 4-WIRE, 1000 FT	4-WIRE	1	X
CONNECTOR, RJ-45	RJ45	10	
CABLE, 6-WIRE, 1000FT	6-WIRE	1	X
COUPLER, INLINE, RJ45	RJ45	2	X
COUPLER, INLINE, RJ11	RJ11	5	X
PUNCH DOWN RJ45	RJ45	1	X

APPENDIX D

REMOTE SITE INVENTORIES

Blue Flag SCS Inventory List

DESCRIPTION	PART #	QTY	KIT #1	KIT #2	KIT #3	KIT #4	KIT #5
TERMINAL CASE							
TERMINAL	LAPTOP	1	20926R	20868R	20925R	20862R	20852R
TERMINAL TRAY	401-43913-01	1	X	X	X	X	X
ADAPTOR, MTRM	401-43932-93	1	X	X	X	X	X
CABLE, MTRM-TSRV	401-43932-06	1	X	X	X	X	X
TELEPHONE	SMALL	1	X	X	X	X	X
CABLE, PHONE, RJ11	401-43932-18	1	X	X	X	X	X
TERMINAL SERVER	16 PORT	1	DE000192	DE001294	DE001121	DE000113	DE000373
CABLE, PPP-TSRV (CMUX)	401-43932-04	1	X	X	X	X	X
CABLE, PPP-TSRV (TLAN)	401-43932-05	1	X	X	X	X	X
LAN INTERCONNECT	DELNI	1	AS33893	AS33895	AS33888	AS33887	AS35905
CABLE, DELNI-TSRV	401-43932-71	1	X	X	X	X	X
CABLE, DELNI-TLAN	401-43932-72	1	X	X	X	X	X
STORAGE SHELF	401-43914-01	1	X	X	X	X	X
STORAGE DOOR	401-43914-02	1	X	X	X	X	X
TRANSIT CASE, HALF CASE	401-39699-22	1	X	X	X	X	X
POWER PANEL	RACK-REAR	1	X	X	X	X	X
NAMEPLATE	401-43906-01	1	X	X	X	X	X
MULTIPLEXER CASE							
DESCRIPTION	PART #	QTY	KIT #1	KIT #2	KIT #3	KIT #4	KIT #5
MULTIPLEXER	13 SLOT	1	C2016502	C2015294	C2015306	C2015315	C2015311
NETWORK MODULE	NCL	1	2144317	2144320	2141957	2144484	2141813
INTERLINK MODULE	ILC.2	1	64504K	64178K	70016K	67433K	66833K
INTERLINK MODULE, SAT	ILC.2S	1	64169K	63885K	66726K	66312K	66462K
QUAD SYNC MODULE	QSP.6	1	2145568	2145552	2145571	2145550	2145561
ENHANCED VOICE MODULE	FXS	1	1042317	1042316	1042326	1042315	1042348
ENHANCED VOICE MODULE	FXS	1	1042325	1042303	1042324	1042355	
ADAPTOR, CMUX-PHONE	NTM	1	S1053200	S1053208	S1053215	S1053308	S1030761
ADAPTOR, CMUX-PHONE	NTM	1	S1053209	S1053210	S1053207	S1053307	S1053309
MUX FAN ASSY	FAN	1	C2016488	C2016485	C2016482	C2016403	C2016487
POWER SUPPLY	110V	1	C09WF06509	C09WF06439	C09WF06727	S09WF01299	C09WF06681
POWER SUPPLY, 48 VOLT	48V	1	S1030857	S1030854	S1030855		S1030856
INSERT REMOVE CABLE	IRP	1	X	X	X	X	X
ADAPTOR, CMUX	401-43932-91	1	X	X	X	X	X
CABLE, CMUX-PPP, MAINT	401-43932-02	1	X	X	X	X	X
CABLE, CMUX-PPP, PHONE	401-43932-10(-17)	8	X	X	X	X	X
CABLE, CMUX-RPP	401-43932-38	1	X	X	X	X	X
CABLE, CMUX-RPP	401-43932-39	1	X	X	X	X	X
TRANSLAN BRIDGE	335	1	7C005116	7C00518B	7C005102	7C0051C5	7C005210
TRANSLAN SOFTWARE	DISKETTE	1	X	X	X	X	X

D-1

Blue Flag SCS Inventory List

DESCRIPTION	PART #	QTY	KIT #1	KIT #2	KIT #3	KIT #4	KIT #5
ADAPTOR, TLAN	401-43932-92	1	X	X	X	X	X
CABLE, TLAN-CMUX	401-43932-40	1	X	X	X	X	X
CABLE, TLAN-PPP, MAINT	401-43932-03	1	X	X	X	X	X
RED PATCH PANEL	401-43925-XX	1	X	X	X	X	X
CABLE, RPP-RIP	401-43932-36	1	X	X	X	X	X
CABLE, RPP-RIP	401-43932-37	1	X	X	X	X	X
PHONE PATCH PANEL	PANEL-REAR	1	X	X	X	X	X
TRANSIT CASE, FULL CASE	401-39699-01	1	X	X	X	X	X
POWER DIST PANEL	60N2518	1	X	X	X	X	X
NAME PLATE	401-43906-02	1	X	X	X	X	X
	CRYPTO CASE						
DESCRIPTION	**PART #**	**QTY**	**KIT #1**	**KIT #2**	**KIT #3**	**KIT #4**	**KIT #5**
CRYPTO MOUNT	HNF-81	1	3666	3657	3663	3665	3662
CABLE, HNF-RIP	401-43932-34	1	X	X	X	X	X
CABLE, HNF-RIP	401-43932-35	1	X	X	X	X	X
CABLE, HNF-BPP	401-43932-32	1	X	X	X	X	X
CABLE, HNF-BPP	401-43932-33	1	X	X	X	X	X
BLACK PATCH PANEL	401-43917-01	1	X	X	X	X	X
FO MODEM	219	1	2926	2925	2917	2911	2920
FO CABLE, FOM-BIP	2 FT	1	X	X	X	X	X
CABLE, FOM-BPP	401-43932-31	1	X	X	X	X	X
CDSU	4202	1	13359	12994	13010	13337	13342
CABLE, CDSU-BPP	401-43932-30	1	X	X	X	X	X
CABLE, CDSU-BIP, LINE	401-43932-21	1	X	X	X	X	X
POWER SUPPLY	28V	1	4523918	450472	453903	453889	453883
POWER FILTER	401-36408-01	1	102	101	104	103	106
POWER DIST PANEL	ON FLOOR	1	X	X	X	X	X
POWER CABLE	18/3	1	X	X	X	X	X
STORAGE DRAWER	8.75"	1	X	X	X	X	X
TRANSIT CASE, FULL CASE	401-39699-01	1	X	X	X	X	X
NAMEPLATE	401-43901-02	1	91EO1	91EO2	91EO3	91EO4	91EO5

Blue Flag SCS Inventory List

DESCRIPTION	PART #	QTY	KIT #1	KIT #2	KIT #3	KIT #4	KIT #5
VTC SUITE							
VTC SUITE, PORTABLE	401-43904-01	1	X	X	X	X	X
NAMEPLATE, VTC	401-43911-01	1	X	X	X	X	X
NAMEPLATE, VTC	401-43911-02	1	X	X	X	X	X
NAMEPLATE, VTC	401-43911-03	1	X	X	X	X	X
NAMEPLATE, VTC	401-43911-04	1	X	X	X	X	X
E-BOX	4000	1	3495	3496	3493	4503	3497
MOTION CAMERA	CAMERA	1	1774-55	1794-55	1805-55	1403-55	1767-55
AUX CAMERA	CAMERA	1	1847-55	1551-55	1836-55	1807-55	1890-55
KEY PAD CONTROL	KEYPAD	1	1729-R67	1891R67	1517R67	1889R67	1513-R67
VIDEO AMP	VDA	1	10910263	10910265	10910312	10910275	10910314
VIDEO AMP	VDA	1	10910271	10910266	19010259	10910276	19010313
CONVERTER	YC-NTSC	1	JJI180	JKI183	JJI181	JJI148	JJI182
VIDEO PRINTER	P71U	1	P71U005398	P71U005406	P71U005425	P71U005394	P71U005400
MONITOR 19"	VIDEOTEK	1	11910546	11910548	11910878	11910882	11910880
MONITOR 19"	VIDEOTEK	1	11910547	11910876	11910877	11910879	11910881
SPEAKER	FOSTEK	1	O220322	O220352	O220321	O220345	O220344
MISCELLANEOUS EQUIPMENT							
DESCRIPTION	PART #	QTY	KIT #1	KIT #2	KIT #3	KIT #4	KIT #5
TELEPHONE	UNITY	6	X	X	X	X	X
FACSIMILE	PANAFAX	1	361030514	361030364	361030521	361030526	361030519
CABLE, CMUX-CAFMS	401-43932-48	1	X	X	X	2	X
CABLE, CMUX-VTC	401-43932-43	1	X	X	X	X	X
PATCH LOOP PLUG	RED	1	X	X	X	X	X
PATCH LOOP PLUG	BLACK	1	X	X	X	X	X
PATCH CORD	2 FOOT	3	X	X	X	X	X
CSU LOOP PLUG	RJ-45	1	X	X	X	X	X
CABLE, CROSSOVER	RJ-45 TO RJ-45	1	X	X	X	X	X
ADAPTOR CROSSOVER	DB25/RJ45	1	X	X	X	X	X
ADAPTOR KIT	DB25M/RJ45	1	X	X	X	X	X
FO CABLE	2 FOOT	1	X	X	X	X	X
COUPLER, INLINE	RJ45	2	X	X	X	X	X
COUPLER, INLINE	RJ11	5	X	X	X	X	X
JUMPER, PIN-PIN	PM0-000001	5	X	X	X	X	X
GENDER CHANGER	DB37 (2), DB25 (2)	4	X	X	X	X	X
MUX KEY	KEY	1	X	X	X	X	X
TOOL KIT	CASE	1	X	X	X	X	X
FO METER	HAND HELD	1	X	X	X	X	X
FO SOURCE	HAND HELD	1	X	X	X	X	X
MULTIMETER	HAND HELD	1	X	X	X	X	X
WRIST STRAP	ESD	1	X	X	X	X	X
CRIMPER, MOD. PLUG	TOOL	1	X	X	X	X	X
4 POSITION DIE SET	RJ11	1	X	X	X	X	X
8 POSITION DIE SET	RJ45	1	X	X	X	X	X
6 POSITION DIE SET	MMJ	1	X	X	X	X	X
AFNET CSU/DSU	4202	1	N/A	13828	N/A	N/A	N/A
AFNET CABLE	RS-449	1	N/A	13828	N/A	N/A	N/A

Blue Flag SCS Inventory List

DESCRIPTION	PART #	QTY	KIT #1	KIT #2	KIT #3	KIT #4	KIT #5
INSTALLATION KIT							
VTC PAPER	ROLLS	2	X	X	X	X	X
FAX PAPER	ROLLS	2	X	X	X	X	X
CABLE, PLAYER TERMINAL	401-43932-99	5	On-Site	On-Site	On-Site	On-Site	On-Site
CONNECTOR, MMJ	MMJ	15	X	X	X	X	X
CONNECTOR, RJ-45	RJ-45	15	X	X	X	X	X
CABLE, 6-WIRE, 1000 FT	6-WIRE	1	X	X	X	X	X
CABLE, PHONE/FAX	401-43932-97	7	On-Site	On-Site	On-Site	On-Site	On-Site
CONNECTOR, RJ-11	RJ-11	20	X	X	X	X	X
CABLE, 4-WIRE, 1000 FT	4-WIRE	1	X	X	X	X	X
CABLE, ATT LINE	401-43932-98	1	On-Site	On-Site	On-Site	On-Site	On-Site
CONNECTOR, RJ-45	SOLID WIRE	5	X	X	X	X	X
CABLE, 8-WIRE, 150 FT	8-WIRE	1	X	X	X	X	X
TUBING, 10 FT	TUBING	1	X	X	X	X	X
BRAID, 10 FT	BRAID	1	X	X	X	X	X
TERMINAL BLOCK	4-POS	1	X	X	X	X	X
TY-WRAPS	6"	50	X	X	X	X	X
TY-WRAPS	8"	50	X	X	X	X	X
CARPET TAPE	ROLL	1	X	X	X	X	X
CLIP NUTS/SCREWS	KIT	kit	X	X	X	X	X
BATTERY	9V	2	X	X	X	X	X
FUSES	KIT	kit	X	X	X	X	X
SPADE LUGS	#6	kit	X	X	X	X	X
CONNECTR, PUNCH DOWN	RJ 45	1	X	X	X	X	X

APPENDIX E

INSTALLATION CHECKLIST

Installation Test Checklist

Administrative
Check in with Site Chief and local point of contact
Check in with Blue Flag Control 904-884-7902
Provide work and hotel phone numbers to Control
Locate DWS equipment crates
Locate Blue Flag equipment crates (terminals)
Locate KGs and COMSEC material
Unpack and inventory DWS equipment with Site Chief
Annotate site inventory list and fax later
Save crate and packing for return to Blue Flag
Locate and use site log - log steps

Site Plan
Review Site Installation Plan with Site Chief
Verify placement of Secure Communication Set
Verify placement of VTC Suite
Verify placement of Terminals
Verify placement of Telephones and Facsimile
Locate power receptacles and check ratings
Locate long-haul comm point of presence (POP)
Plan your cable runs

Secure Communication Set (SCS) setup
Set Crypto Case on floor
Set Terminal Case on Multiplexer Case
Set Multiplexer Case on Terminal Case
Unpack and insert multiplexer cards and power supplies
Set up Maintenance Terminal and Telephone

Crypto Case setup and test
Locate and install KGs
Install KG batteries (9 volt)
Apply power to Crypto Case (power strip on back)
Don't power up Terminal or Multiplexer Case at this time
Verify power to CSU (no switch) and FO Modem (switch on back)
Switch off FO Modem (it will not be used)
Loop CSU with Loop Plug (RJ-45 on BIP Pos #1)
Verify KG#1 and #2 switches are in Network
Program CSU for Internal Clock (INT)
Verify CSU programming D4, AMI, CONT DS0, ACSU, 56, 24, NORMAL, INT, TT
Apply power to KG #1 (on left)
Verify power and clock on KG (Alarm light)
Load KG
Verify KG is in loop (FULL OP and RESYNCH)

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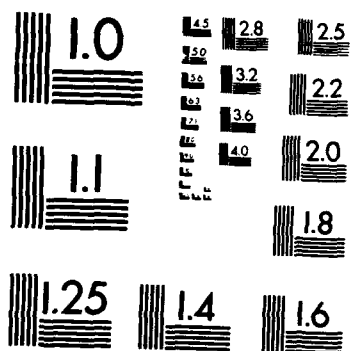
DTIC

Installation Test Checklist

Terminal Case setup and test
Insure switch on rear of Terminal Server is off
Apply power to Terminal Case (power strip on back)
Verify power to Server (switch on back)
Verify power to DELNI (no switch), light on unit
Verify power to Terminal (switch on keyboard)
Set Terminal for 9600 baud (1 return)
Enter user name
Verify operation of Terminal and Server (SHOW SERVICE)
You should see BFxT00_CMX and BFxT00_TLN

Multiplexer Case
Apply power to Multiplexer Case (power strip on rear)
Verify power to Multiplexer (switch on power supplies) and Fan (no switch)
Logically attach Terminal to Multiplexer (C BFxT00_CMX)
Password ESY
Verify Multiplexer System parameters (DSP SY)
Node = Kit #, Ret = 00, OOS = 16, PSZ = 14, CFB = DRI 03, Alarm = 10 (& other nodes)
Verify route to Node 10 (DSP RTE *)
Route for Node 10 = DL 3, PD = 0
Verify data link 3 programming (DSP DL 3)

SPEED	RECEIVE	TXCLOCK	LN DRV	FRAME	SATDELAY	SATBUFF
1344000g	= TX SPD	SND	EXT	02	NONE	
ARQ	RX ARQ	SYNCS	UNIT	SRM SEL	ALMTHLD	AL7MASK
9600		04/LVL 2	SLAVE	NO	DONT CARE	ON
SECURITY	ENCRYPT	GROUP	TRNSLATE	NOD2TRNS		
DISABLE	YES	· · · · · ·	OFF			

Verify that Multiplexer Link #1 loop (DSP ST DL 3) is OK (EX)
Multiplexer ILC #3 should not be in alarm and KG should be FULL OP
Turn off KG and move it into slot #2 on right
Put second KG in slot #1 on left
Apply power to new KG #1 (on left)
Verify power and clock on KG (Alarm light)
Load KG
Verify KG is in loop (FULL OP and RESYNCH)
Verify that Multiplexer Link #1 loop (DSP ST DL 3) is OK (EX)
Multiplexer ILC #3 should not be in alarm and KG should be FULL OP

Long-Haul Comm
Set CSU to Network Clock (NET)
Remove CSU Loop Plug (normal circuit)
Cable from Crypto Case to long-haul comm POP
Observe CSU, KG, and Multiplexer (it may come up)
Call Blue Flag Control and notify that you are ready for Comms
Verify Multiplexer connection (DSP ST DL 3)
Verify connection to Node 10 (NOD 10 DSP SY)
Blue Flag Control will assign connect channels
Comms Up

Installation Test Checklist

Telephones and Facsimile (initial)
X = Site Number
Connect Maintenance Telephone to Phone Patch #7 (Mux Case)
Verify Multiplexer phone definitions (DSP CH 1:11:* and DSP CH 1:12:*)
Channels 1 thru 4 should be "OK" (may require two tries (CTRL D))
Verify dial tone, then call Control (940 or 941)
Install Facsimile (near cases for now)
Plug Fax into Phone Patch #8
Call from Fax (X50) to the Maintenance Telephone (X40)
Call from Maintenance Telephone (X40) to the Fax (X50)
Plug second telephone in Phone Patch #1 (ext X00)
Call both ways X00 to X40 and X40 to X00)
Plug second telephone in Phone Patch #2 (ext X01)
Call both ways X01 to X40 and X40 to X01)
Plug second telephone in Phone Patch #3 (ext X02)
Call both ways X02 to X40 and X40 to X02)
Plug second telephone in Phone Patch #4 (ext X03)
Call both ways X03 to X40 and X40 to X03)
Plug second telephone in Phone Patch #5 (ext X04)
Call both ways X04 to X40 and X40 to X04)
Plug second telephone in Phone Patch #6 (ext X30)
Call both ways X30 to X40 and X40 to X30)
Plug second telephone in Phone Patch #8 (ext X50)
Call both ways X50 to X40 and X40 to X50)
You now have secure telephones

Data Subsystem (initial)
Install Translan software diskette
Verify power to Translan (switch on front)
Verify Multiplexer data definition (DSP CH 1:7:4)
Verify Multiplexer data channel connection (DSP CON *)
Channel 1:7:4 should be connected to Hub (Node 10)
Verify Multiplexer data channel status (DSP ST CH 1:7)
Channel 1:7:4 should be "OK"
Press Break Key, look for Local prompt
Logically attach Terminal to Translan (C BFxT00_TLN)
Password ESY
Verify Translan is talking to Hub Translan (DPS)
Port 1 should be forwarding
Disconnect from Translan (break key)
At the LOCAL prompt
Verify connectivity to Hub (SHOW SERVICE)
You should see a list of devices on Hub ethernet
Reconnect to Multiplexer (R 1)

Installation Test Checklist

VTC Subsystem
Install VTC Suite and Control Box
Connect VTC cables per cable diagram
Install RS-449 cable from VTC Case (E-Box) to Multiplexer Case (7C)
Apply power and verify operation (E-Box BIT)
Verify Multiplexer VTC connection (DSP ST CH 1:7)
Channel 1:7:3 should be "OK"
Verify Multiplexer data channel connection (DSP CON *)
Channel 1:7:3 should be connected to Hub (Node 10)
Call Blue Flag Control to connect to a Hub VTC Suite
Select Main Camera (Display and Send Video)
Test audio Volume Up and Down controls on Control Pad
Test Mute control on Control Pad and MUTE display
Test Main Camera Up, Down, Left, Right, Zoom In, Zoom Out
Select Aux Camera (Display and Send Video)
Test Aux Camera Up, Down, Left, Right, Zoom In, Zoom Out
Test Window On and Off
Test Send Graphics Function
Print from left and right monitors

Telephones , Facsimile, and STU-III
Install Telephones and verify each number (call it)
Install Facsimile in permanent location
Program Fax with address
Test Fax by sending and receiving fax to Blue Flag Fax
Install STU-III as you would any telephone
Verify number by calling it (non-secure mode)

AWSIM Workstation and Terminals
Assist Blue Flag personnel with AWSIM Workstation setup
Cable DecStation to DELNI with GFE transceiver cable
Blue Flag personnel can verify operation
Assist Blue Flag personnel with AWSIM Terminals setup
Cut and crimp cables from VT-320 to DWS Server (MMJ-RJ45)
Verify operation on each terminal (type SHOW SERVICE)
You should see a list of devices on Blue Flag ethernet

CAFMS Terminal
Assist Blue Flag personnel with CAFMS Terminal setup
Cable IBM/PC to CMUX (7A) with 50 ft CAFMS Cable
Blue Flag personnel can verify operation

SACSS Terminal
Assist Blue Flag personnel with SACSS Terminal setup
Cut and crimp cable from TEMPEST VT-220 to DWS Server
Unit should have DB-25 to MMJ connector provided
Verify operation of terminal (type SHOW SERVICE)
Blue Flag personnel can verify final operation

Sentinel Byte Terminal
Assist Blue Flag personnel with Sentinel Byte Terminal setup
Cable Sun Sparc to DELNI with GFE transceiver cable
Blue Flag personnel can verify operation

Site Status Report

Site Number	1	2	3	4
Location	Pt Loma	Shaw	Eglin	Army
Inventory Complete				
Comm Suite installed				
Comm Link operational				
Comm Mux operational				
Maintenance phone operational				
Tlan - Tlan (ethernet) operational				
VTC suite operational				
Fax operational				
Player Phones operational				
AWSIM Workstation operational				
AWSIM Terminals operational				
CAFMS Terminal operational				
SACCS Terminal operational				
Sentinel Byte operational				
STU-III operational				

HUB	
Inventory Complete	
Black Rack Installed	
Red Rack Installed	
San Diego Comm Link operational	
Eglin AFB Comm Link operational	
Shaw AFB Comm Link (AFNET) operational	
Army Comm Link (Fiber) operational	
Comm Mux operational	
Maintenance phones operational	
Tlan - Tlan (ethernet) operational	
VTC Suites (2) operational	
Faxes (2) operational	
Player Phones operational	
DWS Processor operational	
AWSIM Workstations operational	
AWSIM Terminals operational	
CAFMS Van operational	
SACCS Computer operational	
Sentinel Byte operational	
STU-IIIs operational	

APPENDIX F

MANUALS

BLUE FLAG MANUALS

VENDOR	NAME
AUSTRON	Model 1295D Series Distribution Operation and Maintenance
CYLINK	Users Manual
DATABILITY	The VCP200/300 Getting Started Guide
DIGITAL	Installing and Using VT 420 - Video Terminal
DIGITAL	DELNI, Installation/Owner Manual
FOTEC	Fiber Optic Test Kit Operating Instructions
ODS	ODS RS232, Fiber Optic Multiplexers
ODS	Installation Notes for the ODS218/219/229
PHILIPS	Oscilloscope, 100 MHz Dual Time Base PM3070/PM3072
PHILIPS	Oscilloscope Accessories
PICTURETEL	SYSTEM 4000 Installation Guide Operations Guide, Using a System 4000 (Video)
POWER ONE	Single Output SPL Series Specifications and Application Data Sheet
RANDOM	Colleague™ & Colleague Plus™, Users Guide
SOUNDESIGN	Operating Instructions
TIMEPLEX	Link/2, Planning Manual, Link/2, Installation & Maintenance Manual Link/2, Users Guide
VITALINK	Translan 350, Getting Started Manual Software Reference Manual

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